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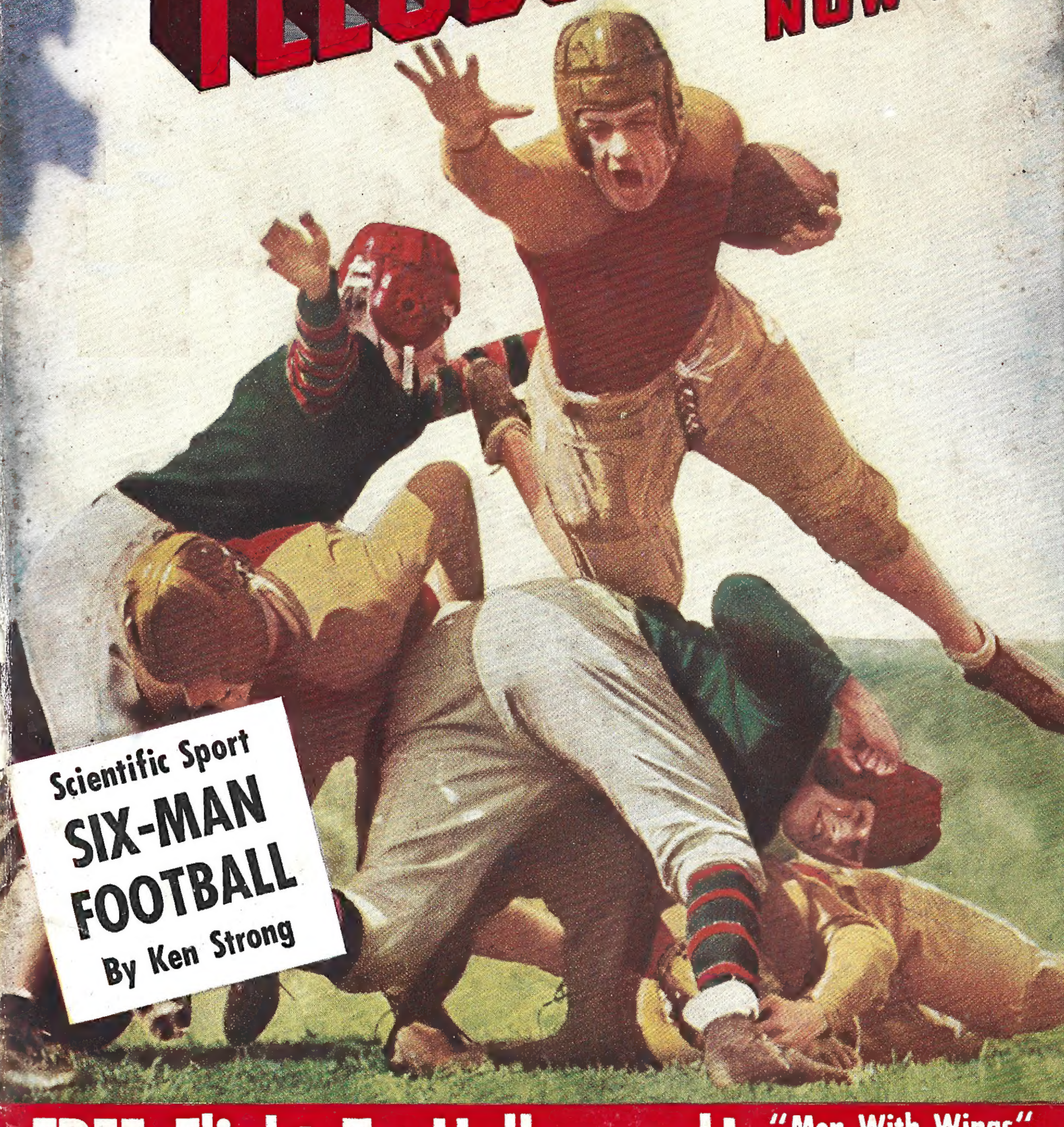

Scientific Sport

SIX-MAN FOOTBALL

By Ken Strong

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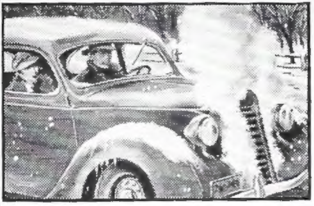
SMILE

...let others BOIL!



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Loss of radiator solution causes freezing, stops circulation. This in turn causes overheating which costs motorists millions every year.

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Most any other kind of anti-freeze will guard against freezing... until it boils away. But "Prestone" anti-freeze protects your car against engine heat...the thief that steals volatile anti-freeze.

Have fun this winter. Cut driving worries. Protect your family, as well as yourself, from freeze-up caused by boil-away. Smile with "Prestone" anti-freeze...*let others boil!*

• • •

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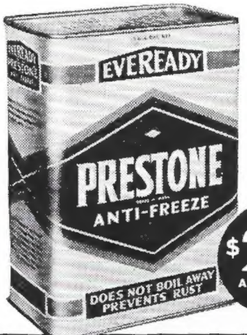
YEAR AFTER YEAR, *more and more "Prestone" anti-freeze has been made and sold, yet demand has outrun production.* This *winter, we expect there will be enough for everyone, for early in the year tremendous new production facilities went into full-time operation. Still, to be* sure, *get yours* EARLY!



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ANTI-FREEZE

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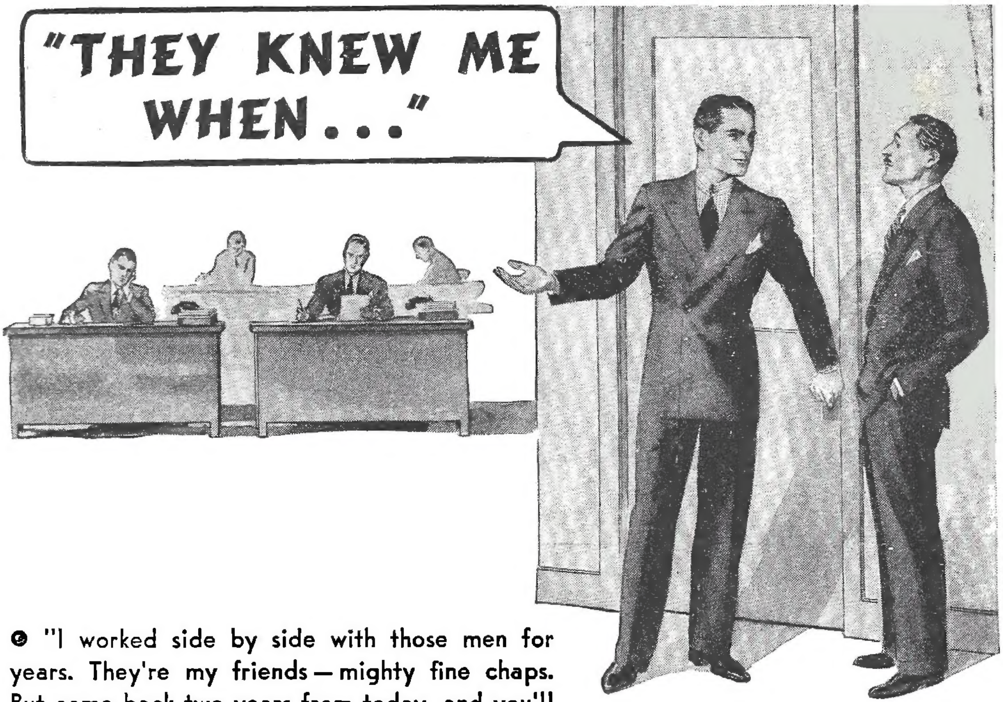
COSTS MORE BY THE GALLON *LESS* BY THE WINTER



● "I worked side by side with those men for years. They're my friends — mighty fine chaps. But come back two years from today, and you'll see those same men at the same desks.

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1938

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Number 1

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Cover photo by William Rittase

SCIENCE DEFIES NATURE!

IMAGINE a forest of 10,000 giant trees confined in a nursery 15 feet square! That's the achievement of James F. Craven, magician-scientist, who dwarfs trees by a secret formula. He has miniature oaks, redwoods, firs and maples 15 years old and less than nine inches high, which, if allowed to grow normally, would be 100-foot giants. Imagine grapefruit the size of golf balls and oranges the size of marbles; roses the size of a thumbnail and giant shrub plants that grow in flower pots! This fascinating story of the scientist who defies nature will be told in the December issue.

NEXT month we will also tell the story of the fun and fury in the life of a deep sea diver who has searched the sea bottom for everything from ocean wrecks to sunken treasure. "Streamlining the Motor Marvels" is another thrill-and-spill story about motor midgets which will be told next month . . . also features of the 1939 cars

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1939
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The leaders of the next ten years will largely be determined in the next ten months. Will you be one of them?

Will You Be Clerk or Manager
Ten Years from Now?

"SURELY, this could never happen to *me*," you say—"that I should be sitting at the same desk—be doing the same work—*for ten straight years!*"

But wait a minute—

Exactly that same thing has happened to thousands upon thousands of men. It has probably happened to men right in the company you now are working for. *And —unless you fit yourself for a better job—there is a very good chance that it may happen to you!*

Unthinkable? That's what J. N. Dixon of Columbus, Ohio, said to himself. Yet lack of training kept him slaving away at low wages for a long time.

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Here is Mr. Dixon's own story—"Just after I returned from the war, one of your representatives found me plugging away at a bookkeeper's job in Marietta, Ohio. He performed a real service and explained to me the need of further training, and induced me to take the LaSalle training in Higher Accountancy. After a few months of study, I secured a position with the Trust Department of a National Bank. This was the stepping stone I needed to various responsible positions including handling of receiverships and other important duties. That quickly boosted my income several hundred percent."

ANOTHER AMAZING SUCCESS STORY

If you think Mr. Dixon's success story unusual, please read what J. H. Krouse of Memphis, Tennessee, says. "When I decided to take your training in Higher Accountancy, I was a clerk. Today I am Chief Consultant Accountant for the U. S. Engineer's Office in Memphis, Tenn. Whatever success or recognition I have had, I owe to your training. I have had no other specialized training along this line. Your method of teaching is not only instructive but highly engaging. I have observed other courses, but firmly believe LaSalle has the best to be had anywhere."

Another bit of evidence is Mr. R. P. Barthalow's experience. Mr. Barthalow is Chief of the Sales Tax Section of the Tax Commission of Ohio. A department which handles over $50,000,000 a year. Mr. Barthalow attributes much of his success to LaSalle training.

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MANY MAKE $30, $50, $75 A WEEK

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The man who has directed the home study training of more men for the Radio Industry than any other man in America.

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Get Ready Now for Jobs Like These

Radio broadcasting stations employ engineers, operators, station managers and pay up to $5,000 a year. Fixing Radio sets in spare time pays many $200 to $500 a year—full time jobs with Radio jobbers, manufacturers and dealers as much as $30, $50, $75 a week. Many Radio Experts open full or part time Radio sales and repair businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, and pay up to $6,000 a year. Automobile, police, aviation, commercial Radio, loud speaker systems are newer fields offering good opportunities now and for the future. Television promises to open many good jobs soon. Men I trained have good jobs in these branches of Radio. Read how they got their jobs. Mail coupon.

Why Many Radio Experts Make $30, $50, $75 a Week

Radio is young—yet it's one of our large industries. More than 28,000,000 homes have one or more Radios. There are more Radios than telephones. Every year millions of Radios get out of date and are replaced. Millions more need new tubes, repairs. Over $50,000,000 are spent every year for Radio repairs alone. Over 5,000,000 auto Radios are in use; more are being sold every day, offering more profit-making opportunities for Radio experts. And RADIO IS STILL YOUNG, GROWING, expanding into new fields. The few hundred $30, $50, $75 a week jobs of 20 years ago have grown to thousands. Yes, Radio offers opportunities—now and for the future!

Many Make $5, $10, $15 a Week Extra in Spare Time While Learning

The day you enroll, in addition to our regular Course, I start sending Extra Money Job Sheets, show you how to do Radio repair jobs. Throughout your training I send plans and directions that made good spare time money—$200 to $500—for hundreds, while learning. I send you special Radio equipment to conduct experiments, build circuits. This 50-50 method of training makes learning at home easy, fascinating, practical.

HERE'S PROOF THAT MY TRAINING PAYS

Chief Operator Broadcasting Station

"When I completed 20 lessons, I obtained my Radio Broadcast Operator's license and immediately joined Station WMPC, where I am now Chief Operator."—HOLLIS F. HAYES, 85 Madison St., Lapeer, Mich.

$10 a Week in Spare Time

"My work has consisted of Radio set servicing, with some Public Address Systems work—all in my spare time. My earnings in Radio amount to about $10 a week."—WILLIAM MEYER, 705 Ridge Road, Hobart, Ind.

Over $1,000 Before Graduating

"Before completeing half the N. R. I. Course I was servicing sets, and I made $1,000 to $1,200 before graduating. I am doing Radio service work for myself now."—ASHLEY G. ALDRIDGE, 1228 Shepherd St., Petersburg, Va.

$200 to $300 a Month in Own Business

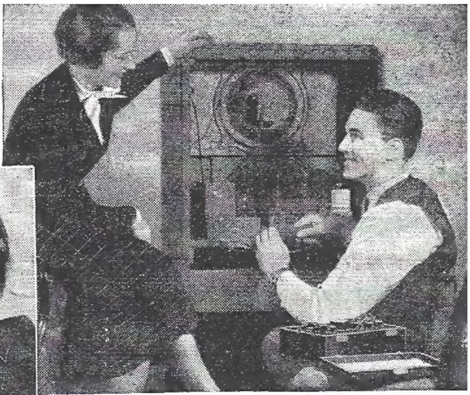
"For the last 18 months I have been in business for myself, making between $200 and $300 a month. I have N. R. I. to thank for my start in this field."—ARLIE J. FROEHNER, 224 W. Texas Ave., Goose Creek, Texas.

Serviceman for Three Stores

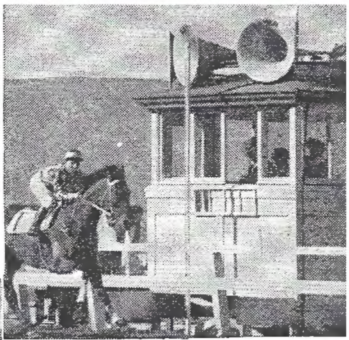
"Along with my own work, I am handling service work for three Radio stores. I think this is good. Most of the plants here have been closed, few people are working."—WILLIAM MOSTELLER, 739 E. 3rd St., Williamsport, Pa.

THE TESTED WAY TO

EXPERT



SET SERVICING. Spare time set servicing pays many $5, $10, $15 a week extra while learning. Full time servicing pays as much as $30, $50, $75 a week.



BROADCASTING STATIONS. Employ managers, engineers, operators, installation and maintenance men for fascinating jobs and pay up to $5,000 a year.

LOUD SPEAKER SYSTEMS. Building, installing, servicing and operating public address systems is another growing field for men well trained in Radio.

AUTOMOBILE RADIO. Another new Radio field—selling, installing, servicing. One million or more auto owners will install radio sets within the next year.

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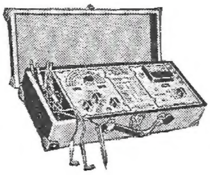

Here is the instrument every Radio expert needs and wants—an All-Wave, All-Purpose, Set Servicing Instrument. It contains everything necessary to measure A.C. and D.C. voltages and current; to test tubes; resistence; adjust and align any set, old or new. It satisfies your needs for professional servicing after you graduate—can help you make extra money fixing sets while training.

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Act Today. Mail the coupon now for "Rich Rewards in Radio." It's free to any fellow over 16 years old. It points out Radio's spare time and full time opportunities and those coming in Television; tells about my training in Radio and Television; shows you letters from men I trained, telling what they are doing and earning. Find out what Radio offers YOU! MAIL COUPON in an envelope, or paste on a postcard—NOW!

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Dear Mr. Smith: Without obligating me, send "Rich Rewards in Radio," which points out the spare time and full time opportunities in Radio and explains your 50-50 method of training men at home in spare time to become Radio Experts. (Please Write Plainly.)

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AND OTHER MEN WITH IDEAS

"We're only entering the great period of inventive advancement" **said C. F. Kettering, Vice Pres., General Motors.**

SOMETIMES we hear people say: "Well, there isn't much left to invent." But Charles F. Kettering, Vice-Pres. and head of Research of General Motors, who helped develop the self-starter, Duco and many other outstanding inventions, **doesn't think that at all.** Not long ago in a published statement, he said:

"If we took half the men employed in tool making and put them to working out new inventions, new things, we could snap out of this depression in no time. Our return to normal times depends on new manufactured products that will catch the purchaser's eye, get him to buy and thus start the ball rolling. Change and buying go together. *We are only entering the great period of inventive advancement.*"

Many Little Ideas Have Big Commercial Possibilities

Some of the world's best inventions came from men who didn't consider themselves inventors at all. The telegraph was invented by a painter, the typewriter by a farmer, the hand camera by a bank-clerk, the stock ticker by a dentist. Or look at small inventions. A husband noticed his wife bending a hair pin to make it stay put. That gave him the idea of the crinkly hair pin. One day a golfer got the idea to make a wooden tee. Now wooden tees are sold by the millions every year. There are many similar examples in inventive history. That is why we say that the books shown here are for INVENTORS and Other Men with IDEAS. Whether you consider yourself an inventor or not—**if you have an idea that will make money, save time, save labor, or give pleasure**—find out how you can protect your rights to it.

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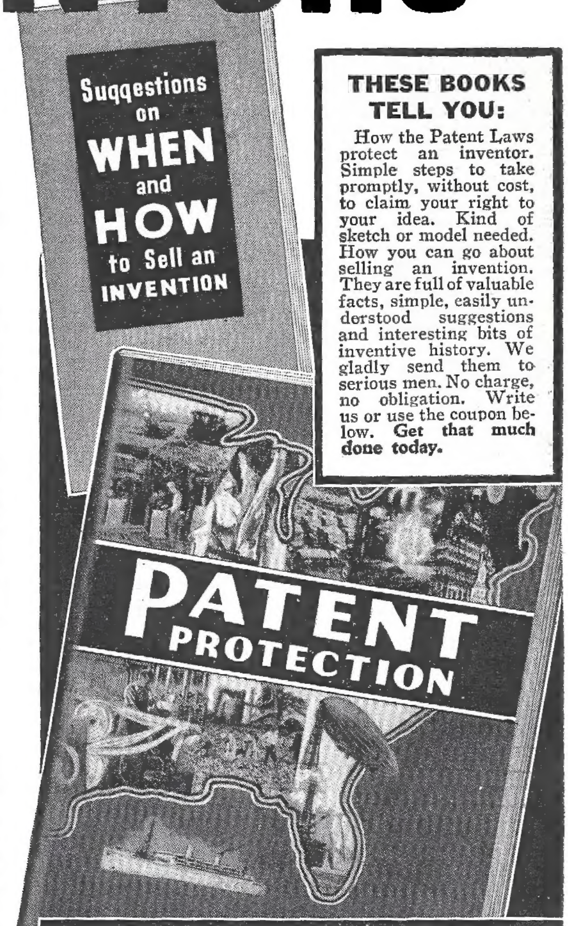
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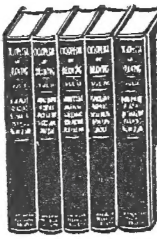

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Now another change is taking place. An old established industry—an integral and important part of the nation's structure—in which millions of dollars change hands every year—is in thousands of cases being replaced by a truly astonishing, simple invention which does the work better—more reliably—AND AT A COST OFTEN AS LOW AS 2% OF WHAT IS ORDINARILY PAID! It has not required very long for men who have taken over the rights to this valuable invention to do a remarkable business, and show earnings which in these times are almost unheard of for the average man.

EARNINGS

One man in California earned over $1,600 per month for three months—close to $5,000 in 90 days' time. Another writes from Delaware—"Since I have been operating (just a little less than a month of actual selling) and not the full day at that, because I have been getting organized and had to spend at least half the day in the office; counting what I have sold outright and on trial, I have made just a little in excess of one thousand dollars profit for one month." A man working small city in N. Y. State made $10,805 in 9 months. Texas man nets over $300 in less than a week's time. Space does not permit mentioning here more than these few random cases. However, they are sufficient to indicate that the worthwhile future in this business is coupled with immediate earnings for the right kind of man. One man with us has already made over a thousand sales on which his earnings ran from $5 to $60 per sale and more. A great deal of this business was repeat business. Yet he had never done anything like this before coming with us. That is the kind of opportunity this business offers. The fact that this business has attracted to it such business men as former bankers, executives of businesses—men who demand only the highest type of opportunity and income—gives a fairly good picture of the kind of business this is. Our door is open, however, to the young man looking for the right field in which to make his start and develop his future.

Not a "Gadget"— Not a "Knick-Knack"—

but a valuable, proved device which has been sold successfully by business novices as well as seasoned veterans.

Make no mistake—this is no novelty—no flimsy creation which the inventor hopes to put on the market. You probably have seen nothing like it yet—perhaps never dreamed of the existence of such a device—yet it has already been used by corporations of outstanding prominence—by dealers of great corporations—by their branches—by doctors, newspapers, publishers—schools—hospitals, etc., etc., and by thousands of small business men. You don't have to convince a man that he should use an electric bulb to light his office instead of a gas lamp. Nor do you have to sell the same business man the idea that some day he may need something like this invention. The need is already there—the money is usually being spent right at that very moment—and the desirability of saving the greatest part of this expense is obvious immediately.

Some of the Savings You Can Show

You walk into an office and put down before your prospect a letter from a sales organization showing that they did work in their own office for $11 which formerly could have cost them over $200. A building supply corporation pays our man $70, whereas the bill could have been for $1,600! An automobile dealer pays our representative $15, whereas the expense could have been over $1,000. A department store has expense of $88.60, possible cost if done outside the business being well over $2,000. And so on. We could not possibly list all cases here. These are just a few of the many actual cases which we place in your hands to work with. Practically every line of business and every section of the country is represented by these field reports which hammer across dazzling, convincing money-saving opportunities which hardly any business man can fail to understand.

Profits Typical of the Young, Growing Industry

Going into this business is not like selling something offered in every grocery, drug or department store. For instance, when you take a $7.50 order, $5.83 can be your share. On $1,500 worth of business, your share can be $1,167.00. The very least you get as your part of every dollar's worth of business you do is 67 cents—on ten dollars' worth $6.70, on a hundred dollars' worth $67.00—in other words two thirds of every order you get is yours. Not only on the first order—but on repeat orders—and you have the opportunity of earning an even larger percentage.

This Business Has Nothing to Do With House to House Canvassing

Nor do you have to know anything about high-pressure selling. "Selling" is unnecessary in the ordinary sense of the word. Instead of hammering away at the customer and trying to "force" a sale, you make a dignified, business-like call, leave the installation—whatever size the customer says he will accept—at our risk, let the customer sell himself after the device is in and working. This does away with the need for pressure on the customer—it eliminates the handicap of trying to get the money before the customer has really convinced himself 100%. You simply tell what you offer, showing proof of success in that customer's particular line of business. Then leave the invention without a dollar down. It starts working at once. In a few short days, the installation should actually produce enough cash money to pay for the deal, with profits above the investment coming in at the same time. You then call back, collect your money. Nothing is so convincing as our offer to let results speak for themselves without risk to the customer! While others fail to get even a hearing, our men are making sales running into the hundreds. They have received the attention of the largest firms in the country, and sold to the smallest businesses by the thousands.

No Money Need Be Risked

in trying this business out. You can measure the possibilities and not be out a dollar. *If you are looking for a business that is not overcrowded*—a business that is just coming into its own—on the upgrade, instead of the downgrade—a business that offers the buyer relief from a burdensome, but unavoidable expense—a business that has a prospect practically in every office, store, or factory into which you can set foot—regardless of size—*that is a necessity* but does not have any price cutting to contend with as other necessities do—that because you control the sales in exclusive territory is your own business—*that pays more on some individual sales than many men make in a week and sometimes in a month's time*—if such a business looks as if it is worth investigating, *get in touch with us at once* for the rights in your territory—don't delay—because the chances are that if you do wait, someone else will have written to us in the meantime—and if it turns out that you were the better man—we'd both be sorry. So for convenience, *use the coupon below*—but send it right away—or wire if you wish. But do it now. *Address*

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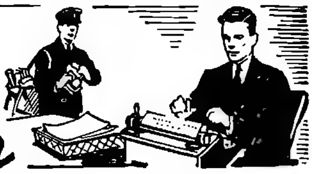
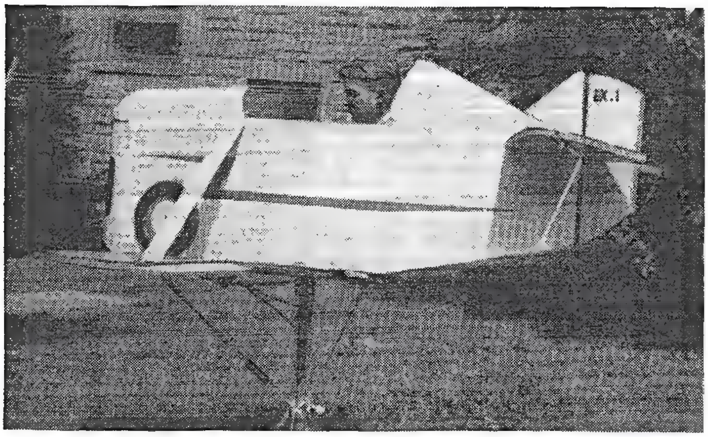


Send in photos of your completed workshop projects. Each month Mechanix Illustrated awards a first prize of $5 for the best photo and letter received by this department and prizes of $3 each for all other photos and letters used.



Bob Ashman is learning plenty about aviation through use of this "backyard trainer" he constructed from MI plans. It responds to the controls in the same manner as a real plane.

REMEMBER the "backyard pilot trainer" how-to-build article that appeared in the July, 1938 issue? Well, Bob Ashman, of West Bend, Wisconsin, was the first MI reader to build the novel trainer and send in a photo and description of it, thereby winning this months' first prize of $5. Bob says he followed MI plans except for a few minor structural changes to take advantage of materials at hand. As can be seen, he added a touch of realism to the trainer by fitting it with a set of landing wheels in a retracted position. The system of cables and springs makes the trainer respond to the controls just as a real plane does and I know that Bob will increase his aviation knowledge considerably from operating it. "Happy Landings," Bob, and avoid tail-spins!

***

Speaking of aviation, be sure and read the details of the nation-wide contest being sponsored by Fawcett Publications in co-operation with Paramount Pictures which appears on page 70 of this issue. Based on Paramount's new all-Technicolor production—"Men With Wings"—the contest is one that every MI reader can enter and, when you read about the excellent prizes that will be awarded, you'll agree, I'm sure, that it will be well worth your time to enter the contest.

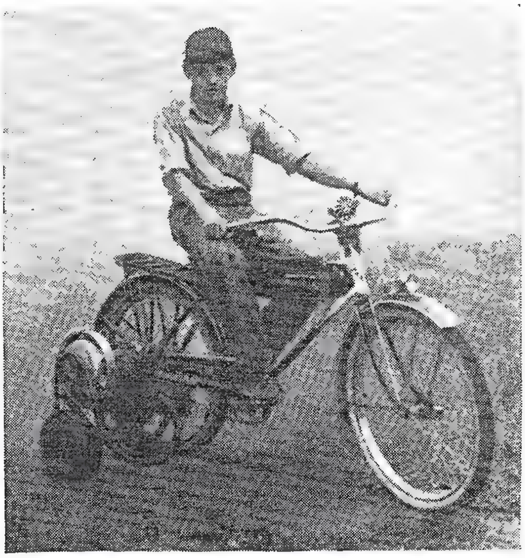
***

One of the most popular how-to-build articles ever featured in MI was the "Tri-Bike" which appeared in the July, 1937 issue. As you may recall, the plans showed how to adapt an old gasoline washing machine motor to a bicycle, making it a powered vehicle. Morgan Ware, of Huntington, Ind., was awarded a $3 prize for his photo showing the "Tri-Bike" he assembled from the plans. He claims the powered bike will carry a 160-pound rider at a speed of 25 m.p.h.. Comfortable knee-action riding is provided as a results of a detachable pivot of his own design. Morgan says he will be glad to answer any inquiries about his powered bike, so if you want the "dope," send him a letter at 346 S. Jefferson St. Be sure and enclose a stamped, return envelope.

***

Don't throw away your old shoes anymore. Instead, read the interesting article—"New Uses For Old Shoes"—which will appear in the

[*Continued on page* 14]



Morgan Ware converted his bicycle into a powered vehicle by adapting a washing machine motor to it as explained in MI.

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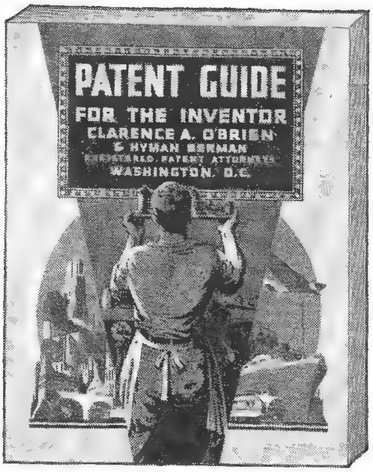

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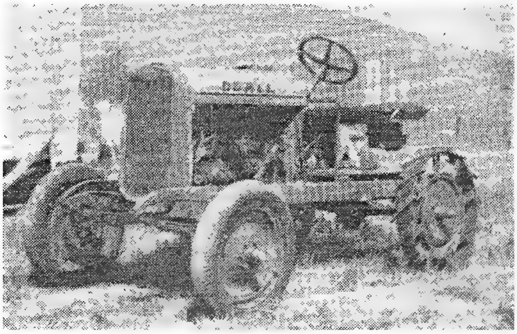
Editor's Workbench Chips

[*Continued from page* 12]



Fitted with a centrifugal-type engine governor and two transmissions, this powerful farm tractor was built by Ken Lentholtz.

December issue, and you'll find out how to use the "old dogs" for making leather watch fobs, plaited belts, a coin purse and many other useful leathercraft items. Making them is much easier than you'd think, too.

***

Rural readers will be particularly interested in the photo sent in by Kenneth Lentholtz, of Rio Vista, Calif., since it shows a home-built tractor that does many a hard job around the farm. Ken built the tractor from parts of an old 1928 auto and an obsolete truck, buying only the lug-type wheels. It has two transmissions and is fitted with a centrifugal-type engine governor. Good work, Ken. Watch for the mail-man bearing MI's check for $3.

***

Scoring a $3 prize, a photo sent in by Kenneth Clinton, of Torrington, Conn., shows a detailed scale model of the famous ocean liner—*Queen Mary*—which he and a friend, Berndt Helberg, constructed. Nice work, boys, but I wish you had supplied some dimensions so I could give our readers some idea of the size of the model. Remember that in the future, will you? Thanks.

[*Continued on page* 16]

This unusually detailed scale model of the giant ocean liner *Queen Mary* built by Kenneth Clinton and Berndt Helberg.

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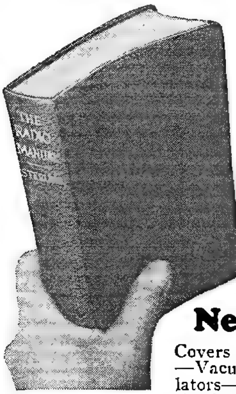

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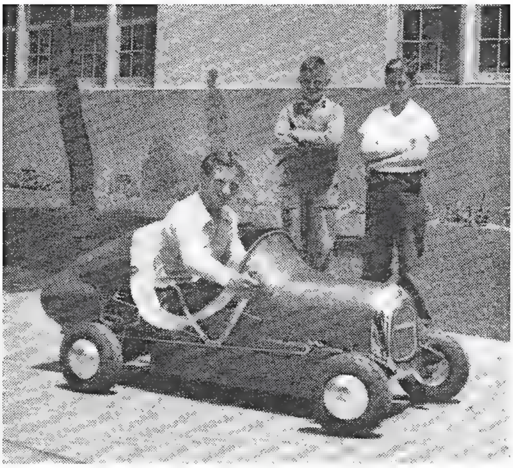
Editor's Workbench Chips

[*Continued from page 14*]



Envious friends look on as Albert Blazic, Jr., proudly poses in the cockpit of the midget racer built for him by his dad.

Snappy in appearance is the midget racer Albert Blazic, Sr., of Oakland, Calif., constructed for his son. The tiny car is equipped with a one cylinder, four-cycle engine geared to a chain drive and is said to travel 45 m.p.h. A foot accelerator, foot clutch and internal brakes are other features of the 52-inch wheelbase car. It's a winner, Blazic, and I'm sending you $3 to prove it.

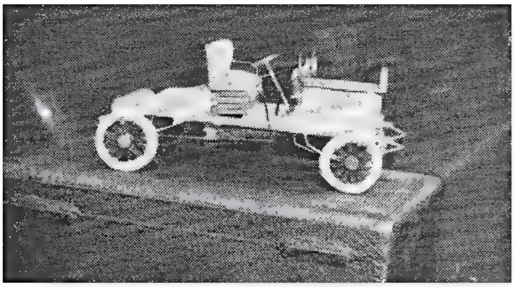
***

Remember the 1904 Buick automobile model project that was featured in the November, 1937 issue of MI? Well, Bernard Nedeau of Gorham. N. H., followed the plans and constructed the model from sticks, cardboard and old clothes line (in the case of the tires). The model is only 7½ inches long, but it is perfect in every detail, even to upholstery, so I'm sending Bernie a $3 award.

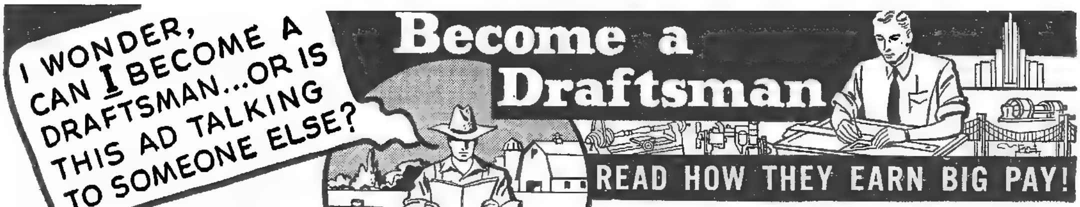
***

Powered scooters threaten to become a serious rival of midget racers in MI fan interest. John

[*Continued on page 19*]



An unusually novel project is this 1904 Buick automobile model constructed from pins, cardboard and rope by Bernard Nedeau. The plans appeared in MI in November, 1937.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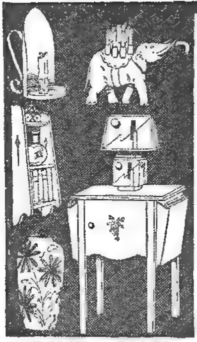

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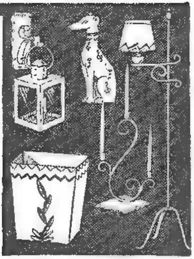

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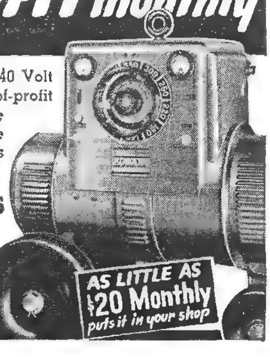

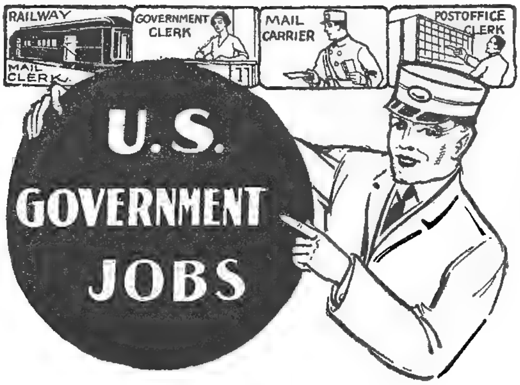

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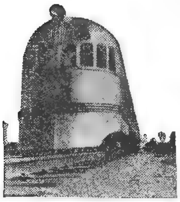

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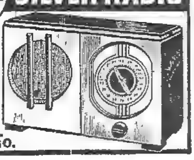

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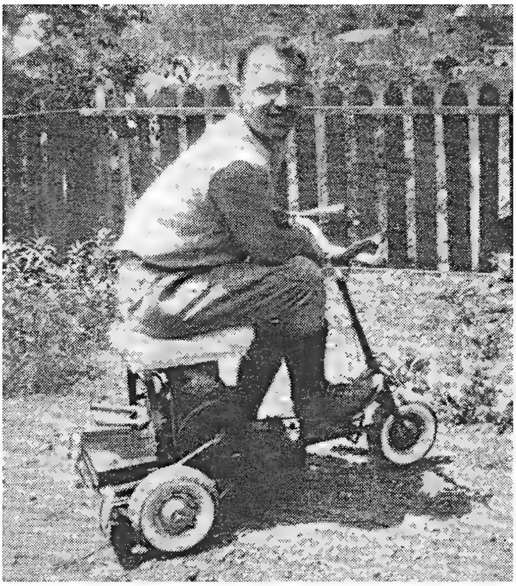
Editor's Workbench Chips

[*Continued from page* 16]



Built by John Mock, this scooter has three wheels instead of the usual two. It is powered by a washing machine motor.

Mock of Creighton, Pa., is one of the latest scooter enthusiasts and sent along a photo of his home-built job to prove it. John's "buggy" has three wheels and although it can only go 18 m.p.h., it boasts a mileage of 90 miles per gallon. Powered by a half-horsepower washing machine motor, the scooter features two-wheel brakes, a slip clutch and a cushioned seat. Okay, John, I'm sending you $3 for gas.

***

From far away Australia, I received a letter from Gordon John asking me to list his name and address with mention of the fact that he'd like to correspond with MI readers who are interested in stamps, naval affairs, and cycling. Gordon's complete address is: 51 Moore St., Perth, Australia, so drop him a line if you want to gain a new pen-pal.

***

In producing a magazine like MI, the editors must necessarily be guided in their selection of articles by their belief as to what subjects will be of most interest to the most persons. Naturally, letters received from readers help the editors to decide, so if you are enthusiastic about some particular hobby and want to see more articles on it, why not write to the editor and tell him so? Just say—"I like articles on building boats" or "I like to see articles on model airplanes" or "How about more articles on photography?" Do it today before you forget about it.—*The Editor*

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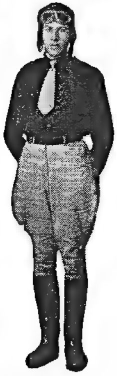

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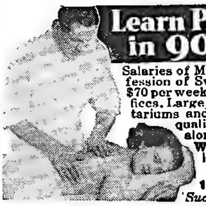

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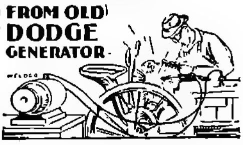

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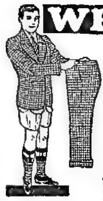

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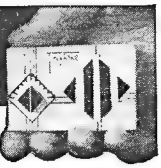

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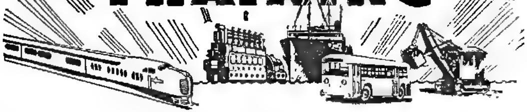

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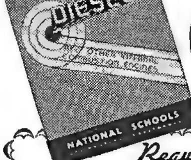

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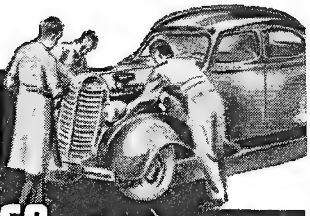

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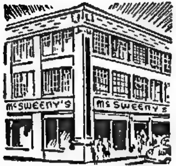

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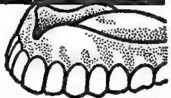

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U. S. Bureau Reports Public Lands Contain Platinum

Discovery of "promising" amounts of platinum in the LaPlata Mountains of southwestern Colorado on unclaimed public land open for location was announced recently by the U. S. Geological Survey. It is said to be the first promising platinum find in the continental United States.

Found by a chemical analysis of ores collected by Edwin B. Eckel, who has been doing field work in the La Plata region for several years, the platinum metals content of some samples is as high as .54 ounces of platinum and palladium per ton. Platinum currently sells at $33 an ounce.

Geological Survey experts declined to advise on possible production and methods of working this deposit. From other sources it was learned, however, that if the ore body found is large enough, the platinum can best be mined on a by-product basis—the ore body worked for copper and the platinum metals recovered during the electrolytic refining processes. This method of recovery has already proved successful in Canada.

A possible rush of prospectors to the district, not far from the silver mines of Durango, is foreseen. The new finds warrant at least "thorough examination," the Geological Survey declares.

Occurring two miles above sea level on Copper Hill, between Bedrock and Boren Creeks, near the old town of La Plata and 21 miles northwest of Durango, the platinum-bearing veins have already produced 4,500 ounces of silver and 225,000 pounds of copper. Most of this production occurred between 1911 and 1917, when a great "glory hole" and a 600-foot tunnel were excavated.

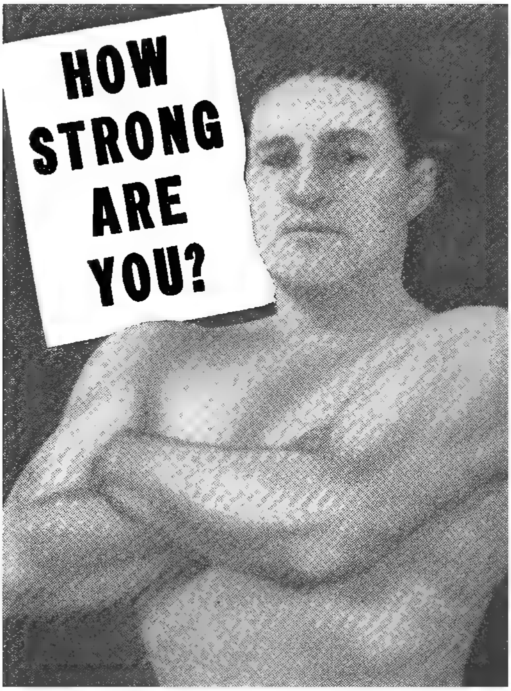
Buried by soil and debris from an ancient glacier, much of the ore body is hidden, and only a fraction of it, known to be 150 feet in diameter and 50 feet deep, is exposed. Further exploration by diamond drilling will show the extent of the platinum-bearing rock.

U. S. Gliding Expert Locates "Ideal" Soaring Site

A soaring site rivaling Germany's famous Hornberg, which has been the envy of glider enthusiasts the world over, has been located near Monteagle, a town near Nashville, Tenn., Lewin B. Barringer, editor of Soaring magazine and a premier motorless flight pilot, reported.

Found in the course of demonstration flights from Nashville Airport, the site was flown over in a powered airplane by Barringer and Major Walter Williams, Tennessee aviation director. On their return they recommended its development for regular glider use.

Consisting of a plateau projecting out from a mountain, it is believed suitable for slope soaring, one of the most popular phases of the rapidly spreading glider art.



Tommy Loughran, Ex-World's Champion

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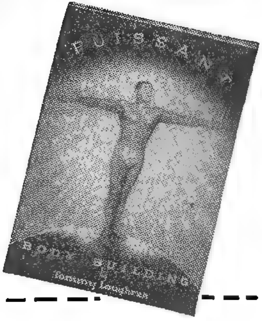

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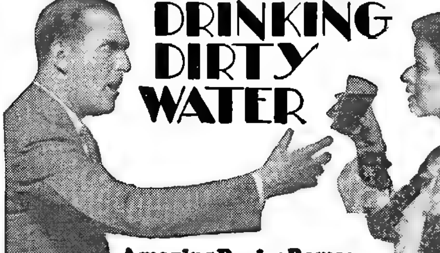

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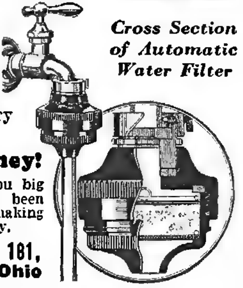

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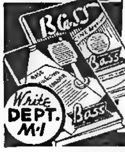

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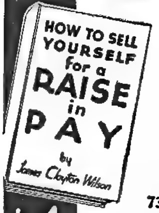
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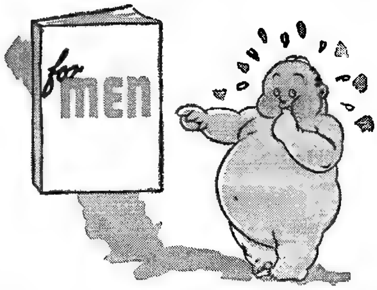

Our natural modesty would prevent us from making any wildly extravagant claims about FOR MEN, the pocket-size men's magazine. We wouldn't think for a minute, for example, of calling our reading matter excellent and our cartoons superb. Yet in this morning's mail we received this comment:

> **"I enjoy FOR MEN very much. The reading material is excellent and the cartoons are superb—neither offensive nor lacking in punch"**
> **—Ronald Carter,**
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> **—Robert S. Schaerges,**
> **Columbus, Indiana**

Each month FOR MEN publishes twenty-odd hearty, male articles and two dozen funny color cartoons. The November issue contains such features as "A Tramp for Every Purse" by Stanley Walker, "How I Broke Into Pictures" by Will Cuppy, "Dollars and Dropkicks" by Jack Miley, and many others.

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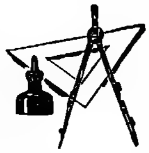

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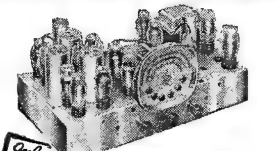

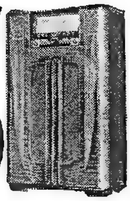

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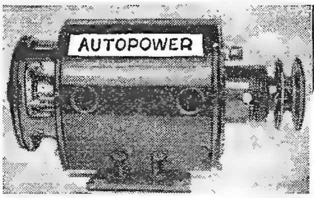

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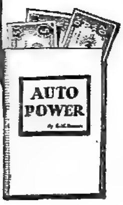

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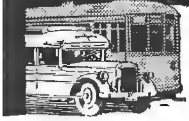

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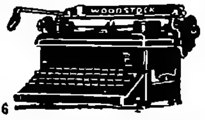

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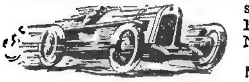

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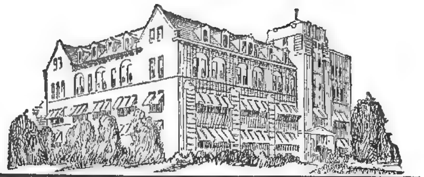

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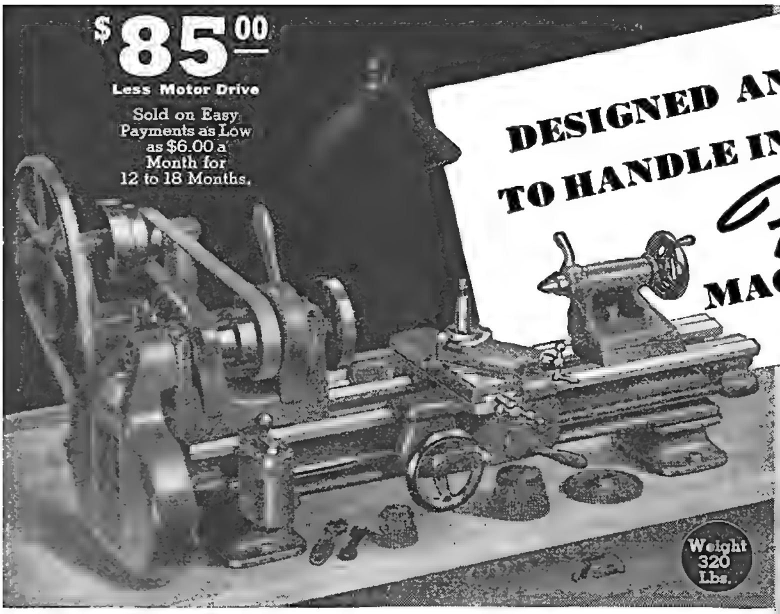
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There are 5 sizes of South Bend Lathes—9", 11", 13", 15" and 16" swing with bed lengths 3' to 12'. In motor or countershaft drives. Priced $85 to $1500.

MECHANIX ILLUSTRATED
Vol. XXI No. 1
W. H. FAWCETT Publisher
November 1938

Scientific Sport-Six-Man Football

Here are the directions for playing a thrilling new game, as explained—

by
Ken Strong

*In collaboration with
Cecil Carnes*

MECHANICAL perfection in play execution, with added thrills in spectacular open-style running formations, safety and economy are the themes of America's newest sports craze—six-man, or stream-lined football.

And every gain the game makes up the side-lines of the nation's popularity is deserved. The main idea in sports is to develop the players and to thrill the spectators. Six-man football will do both in a manner to

This is why when you mention football to youths all over America they think of Ken Strong, shown at right. He was the nation's outstanding collegiate scorer at New York University, and All-American team selection. His scoring record is still up there for the ball toters to shoot at. After brilliant playing with the New York Giants, he followed it with further triumphs with the New York Yankees. Now the Football Giants are starting a talent farm so Ken this year will bolster up, as player and coach, the Giants' Jersey City team. Later in the season he will be back in the Giants' lineup.

Above—A tousled-haired linesman takes one out of the air. Below—All lined up and rarin' to go!

"Coach" Strong demonstrates the punt, and shows how ball strikes foot.

This photograph caught the ball just after it struck the foot.

This photograph shows the necessary follow-through for the punt.

supplement its big brother, the full-sized game, but it will do more; it will bring a new universality to football. It will develop thousands of new players and it will bring their money's worth to millions of on-lookers who otherwise, conceivably, could never enjoy it.

But first I must explain what six-man football is. The teams consist of two ends, a center, a halfback, a quarterback and a fullback. This tends to eliminate heavy linesmen and bone-crushing, power-plays.

Players wear sneakers, or basketball shoes, and this keeps down injuries. Since there are fewer men on the field, there quite naturally are fewer pile-ups in tackling. Everything about the game is designed to eliminate injuries, and although there are already more than 2,000 teams playing the capsule-size version of football—more than the number of colleges playing the regular sized game—there have been no fatal injuries yet as far as I can learn. This is highly significant, when you consider 11-man team "casualty lists."

Of recent years there has been a tendency in collegiate football to commercialize the sport. Consequently, the smaller schools have had to take a back seat. The "gate" has become the all-important thing, instead of the original, primary purpose of the contest: to develop the players and provide clean sport.

Then, too, an emphasis has been placed on strength and endurance in the big game. Here in the six-man contest strength will not be important. But brain-work and well planned strategy are paramount. Since there are fewer men on the field, every play will be more individual. A single man will block a defensive player, where in regu-

Here the ball carrier is being dropped in his tracks. With only six players, pile-ups are less frequent than in the eleven-man game.

The center is receiving instruction on how to envelop the ball, and how to tilt and cup the hands over it for a perfect pass-back. No weight is to be placed on the ball, Ken Strong warns.

lation football two, and sometimes three men are used.

Thus we find that players will be developed both physically and mentally. And not just a score of highly trained specialists, either, but the whole male enrollment of the school can benefit by the competitive spirit. Boys who attend an institution where money is not available for equipping a full team, or buying impressive stadia, now may know the thrills of carrying the ball on a long run, or catching the winning pass. And they can know another excitement, too: that of making a dramatic play before the home town folks.

From my own gridiron history a story can be brought out which will perfectly illustrate a pertinent point. At West Haven, Connecticut, High School, when I was there, we had seventeen or maybe eighteen men on the football squad. Consequently, we had to bring in towns-folk in order to scrimmage. We could have had a well-rounded six-man football team, able to practice plays to perfection.

Joseph P. Doakes, out in Four Corners, Iowa, an 120-pound boy with plenty of courage, might never be an All-American. But he now can gain athletic fitness, leadership, self-confidence and co-ordination on the football field, through this new game. Now let us go with Joe down to the gridiron behind the school, and I'll tell you where his game, the only one his small school can afford because of lack of man-power and finances, differs from its parent.

First thing, of course, you will notice that the field is only eighty yards long and forty yards wide, with the markings five yards apart. Then you will examine the goal posts, which are wider and have lower cross bars. This makes field goals easier. Joe's teammates, who will not necessarily be husky fellows, will be kicking the ball around, with rubber shoes.

When scrimmage starts, the teams line up in a manner unique to followers of the orthodox game.

For the "open" game so perfectly suited to six-man football, the player must have the correct grip on the ball for those long spectacular passes.

Extreme right—"Coach" Strong shows one of the players the correct stance for getting off a long pass.

The defensive team puts the ball into play by kicking it off from a line twenty yards in front of the goal they are defending. The Sixes who are receiving may line up anyway, just so none of them are less than ten yards from the ball at the kick-off. The lineup on both sides looks pretty thin at this point, which makes you understand why the field has been narrowed. As it is, each player has more space to play in than a man in the full-sized game. There are 267 square yards for each man in stream-lined football, to 242 square yards per man in the big game.

Here is the kick. The receiver is dropped in his tracks and you note that this is no sissy's game, that there are plenty of man-sized tackles. Now both teams line up, with three men on each side of the line. There is a penalty of five yards and loss of the down for non-compliance of this rule. After a few plays we note one very important change from the larger game. It is true that the plays in general are approximately the same as the "elevens" use, but a ball carrier, receiving the ball from center, must pass it to a team-mate before it can be advanced past the line of scrimmage. In other words, there can be no direct line bucks.

It can be a forward, or backward, or lateral toss, but it must be a pass. The ball must go through the air at least two yards after leaving the passer's hand and before entering the receiver's hands. If the ball is downed back of the line before the pass, there is no penalty, but if the carrier is stopped at the line before passing, the ball is returned to the place at which it was put into play and there is the loss of a down. If the ball does not travel the prescribed distance in the first pass, the penalty is the same.

A forward pass is okay from anywhere back of the line of scrimmage, which is a take-off from the rules of professional football. In the eleven-man type the passer must be five yards back of the line. The Sixes are all eligible to receive a pass except for the center. It has been suggested recently that this rule be changed so that anyone on the field may snare a pass at anytime.

After eight minutes of exciting play, during which no one was injured and there were many exciting passes and excellent running back of punts, the quarter ended for Joe's scrimmage session. There are only 32 minutes of actual play in the game, another radical departure which will stave off injuries. It is after a player is exhausted that he is most likely to suffer injury.

We have noted, by this time, that there are no unsung and unnoticed "plow horses" on the team, that everyone gets a chance to shine. There are no fellows who get all the scoring breaks, because of the variance necessary for succesful surprise passes. I hardly need mention that in 11-man football the linemen get the jolts and the backs get the headlines.

We see, too, that there are few hidden ball plays, since the rules provide that a two-yard pass is necessary to start the play, and there are too few men to screen such an attack. So we find lots of double and triple passing behind the lines and many short run-

The correct method of receiving a pass. Note that the ball must be trapped and held at the proper angle or it will be dropped.

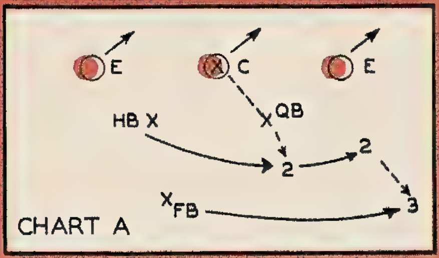
ning passes to the ends. Then there are hair-raisers galore, such as starting the play with a backfield lateral pass and a sweeping run to the right, with the left end blocking and then dashing to the extreme left of the field to catch a field-wide lateral while free of any opponent.

After such an observation we become convinced that zone defense against passes will not be effective, that a man-to-man defense, such as is employed in basketball, is necessary.

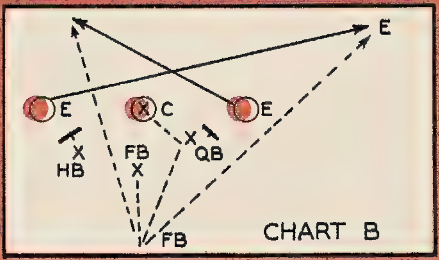
Because of the size of the field, punting must be very accurate and can be made a powerful weapon; the team with an accurate kicker has an important advantage. The kicker has more time, because there are fewer men to rush him. When his team is backed up against its own goal line he can always place the ball so far down the 80-yard field that he snatches the advantage away from his opponent.

I have heard a bit of skepticism from other football devotees over punting with sneakers, or basketball shoes. But I have absolute proof that these rubber brogans may be used to good advantage on the football field. In December, 1934, when I was playing halfback with the New York (Football) Giants in the game with the Chicago Bears for the professional football title, we were behind 13 to 3 at the half. But we changed to sneakers because the ground was frozen and cleats were of no benefit, and I punted, kicked off, made points after touchdown, all in rubber

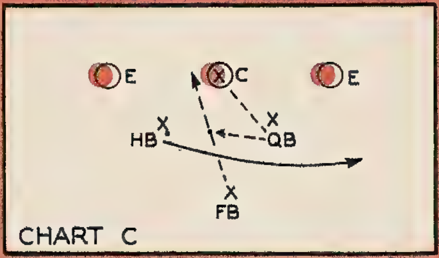
[*Continued on page* 154]



Center passes the ball to the quarterback, who pivots and throws a lateral to the halfback. In the meantime, the fullback has run toward the side-line, and is in position to receive a pass or lateral from the halfback. When the fullback receives the ball, he continues across the line of scrimmage. The ends and center cut down field to block out the secondary defense.

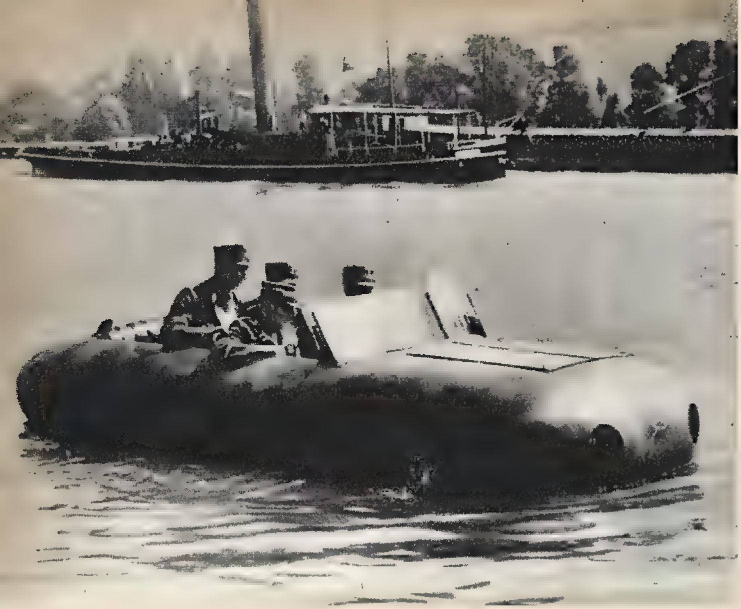


The center passes the ball to the quarterback, who flips a backward pass to the fullback. The fullback either backs up a few steps or runs laterally and then throws a long pass to either end. The ends cross about ten yards down the field. The center, halfback and quarterback block for the fullback on this play.



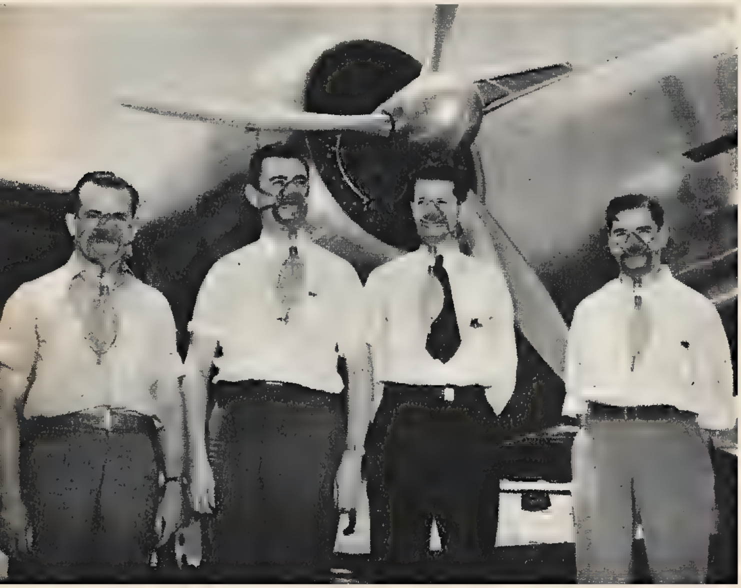
The ball is snapped back to the quarterback, who fakes a lateral pass to the halfback. As the halfback pretends to be cuddling the ball just out of view of the defensive team, the fullback delays momentarily and cuts over center scooping up a lateral pass from the quarterback as he nears the line of scrimmage.

Below—"Coach" Strong takes the toss from center and sends a well executed side pass to the halfback. The quarterback proceeds as interference or as a possible receiver for another pass.



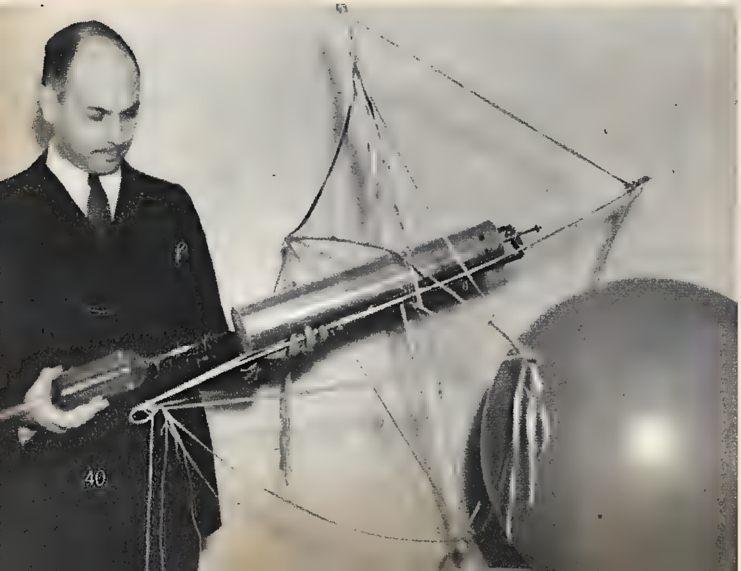
Amphibian Car Hits 72 M.P.H. On Land

RESEMBLING a hippopotamus, this amphibian auto recently was demonstrated by the German Army for the benefit of visiting Italian officers. Capable of carrying ten men, the auto-boat can be driven off the road into the water where it shows a speed of 12 miles an hour. On land it is capable of a seventy-two-mile-an-hour speed. In time of war, blown-up bridges will not stop this car.



New Mask Aids Altitude Flying

WEARING a simple four-ounce rubber nose-piece and artificial balloon lung which can be attached to mobile tubes of oxygen, these four men were members of a party of ten that flew through the sub-stratosphere from Minneapolis to Los Angeles. This apparatus has the advantage of allowing passengers and crew of such a flight to move about the plane freely. Left to right they are: Mal Freeburg, pilot; Dr. William Lovelace, inventor of the mask; Mel Swanson and B. F. Ritchie, co-pilots.

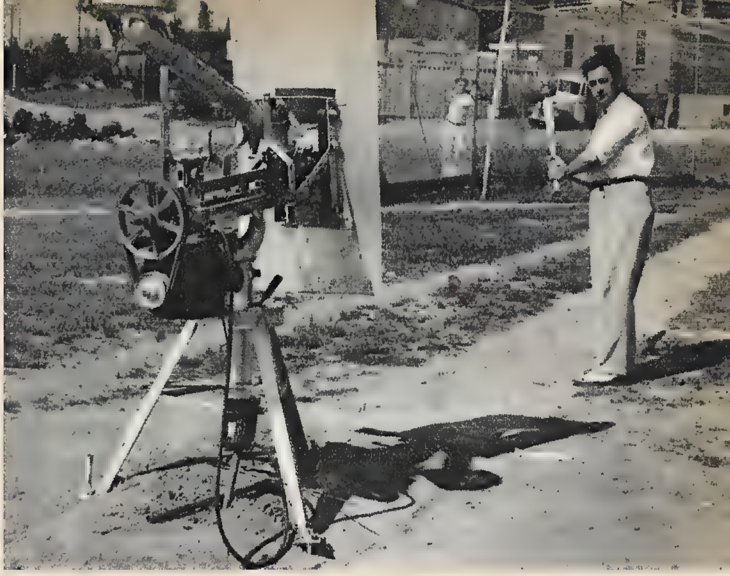


Device Samples Air In Stratosphere

THIS new tube sounding balloon will enable officials of the United States Weather Bureau to capture and analyze samples of the atmosphere found in the stratosphere. The photograph shows L. T. Samuels, assistant chief of the aerological division, inserting the glass flask in which air is collected in its carrying case. A parachute lowers both after the balloon has burst.

Machine Gets Each Ball "In The Groove"

BYRON MOSER, a St. Louis banker with a mechanical inclination, tries out the mechanical pitcher he has built. The device pitches four balls a minute, every one of which is a strike. The speed and height of the ball can be regulated to suit individual conditions. With this machine, batters can get their "batting eye" earlier in the season than usual with only regular practice.

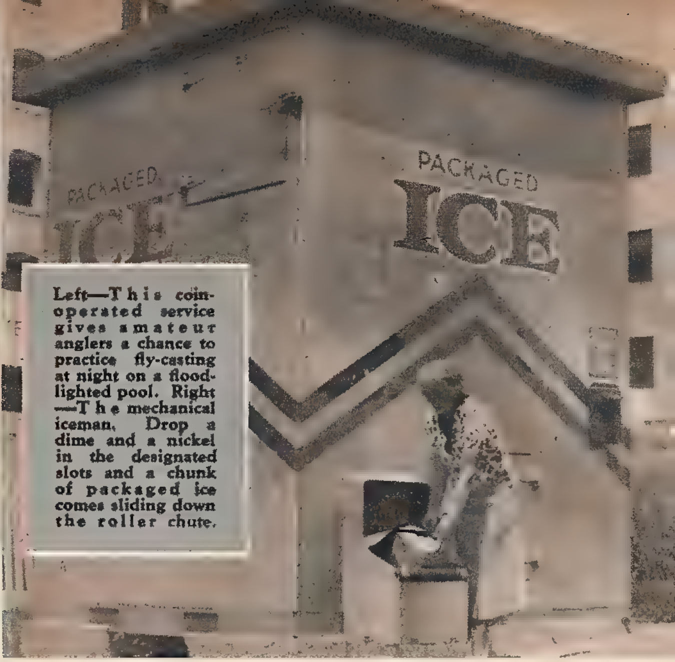


Complete Towns Built In Miniature

THIS lilliputian village is built to scale and is authentic in every detail. Weighing twenty tons, the complete model consists of tiny cities, villages, churches, railroads, farms, bridges, tunnels, mountains, waterfalls, and other realistic features. Laurence Geiringer, builder, is shown explaining to two youngsters the construction of the fields. Note the covered bridges, so common in rural areas. All details are correct, even to the people walking along the streets.

Heated Blanket Keeps Baby Warm

THIS electrically heated crib blanket maintains a pre-set temperature level regardless of changing weather conditions. Despite the wiring it contains in its double thickness, it can be laundered easily and is shockproof even when wet. If the blanket temperature accidentally rises twelve degrees above body temperature, the current shuts off automatically, preventing overheating.



Left—This coin-operated service gives amateur anglers a chance to practice fly-casting at night on a flood-lighted pool. Right—The mechanical iceman. Drop a dime and a nickel in the designated slots and a chunk of packaged ice comes sliding down the roller chute.

ROBOTS That Work For A Coin

PUT a coin in the slot and get your shoes shined, see a movie, pay the installment on the washing machine or get a scalp massage. There is hardly an amusement nor a personal service rendered mechanically that hasn't been put on a coin-in-the-slot basis. Coin-operated pool tables and even fly-casting pools with metered illumination for evening use are among the latest applications, a few of which are shown on this page.

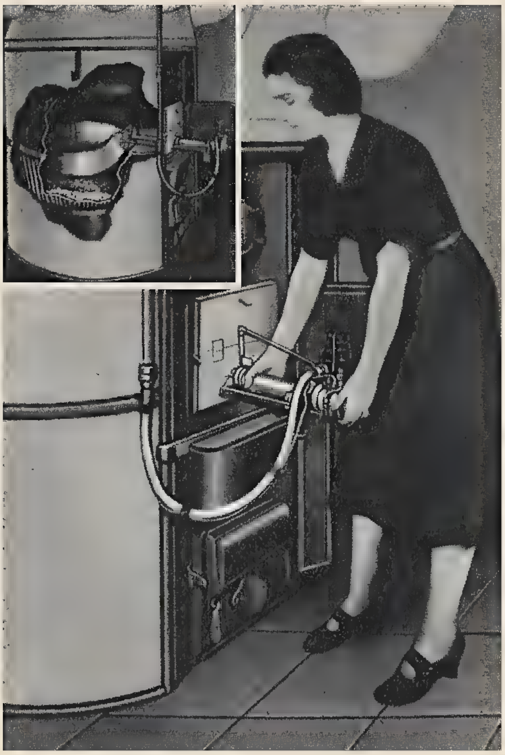
EMERGENCY GAS STA.

Above—Help for stranded motorists is provided by these automatic gasoline stations where a coin releases a gallon can. Right—A quarter in the slot illuminates this tennis court.

Breeds Odorless Marigolds

ODORLESS marigolds, bred in the face of nature's historic refusal to produce marigolds whose foliage did not smell, have been cultivated by David Burpee, cousin of Luther Burbank, famed naturalist. He is shown testing specimens for odor with an "osmoscope" device.

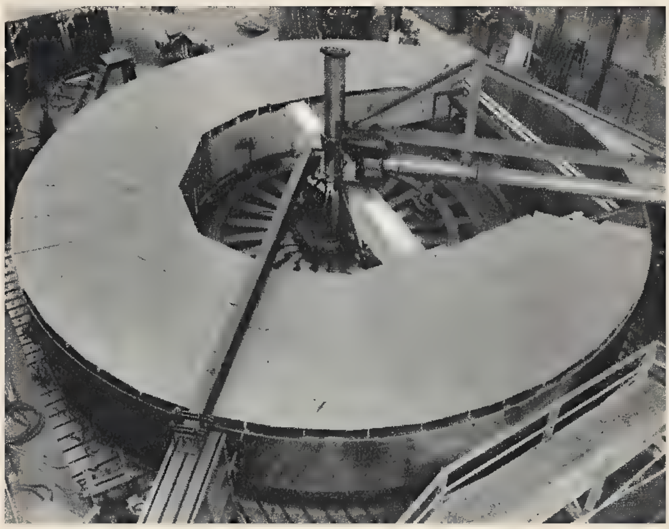
Gas Unit Fits Furnace Door



HEATING plants designed for use with solid fuels can be easily converted into a gas burner through installation of a new unit which fits into the door. Thermostatically controlled, the unit furnishes the right temperature at all times and can be installed without removing the fire door or grates.

"Sunbonnet" Prevents Expansion Of Bearing

THE sun's rays, streaming through the skylight of the plant in which it is being fabricated, caused so much expansion in the huge 317,000-pound bearing that will be used to carry the million-pound weight of the 200-inch telescope being built atop Mount Palomar in California that engineers had to cover it with a "sunbonnet," as shown in photo, before craftsmen could work the bulk of steel into a perfect circular shape.

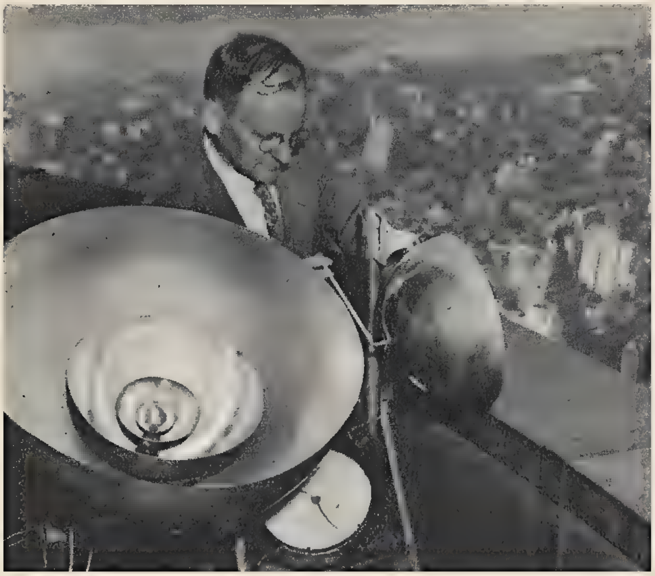


U. S. Navy Diver Sets Record

BREATHING a mixture of helium and oxygen within his electrically heated diving suit, William Baddeus, master diver of the U. S. Navy, recently set a world's record by descending, under simulated sea conditions, to a depth equivalent to 500 feet. The record dive was made in a tank at the navy yard in Washington, D. C., during experiments to improve submarine salvage methods.

Stereoscopic X-Ray Devised

A NEW stereoscopic X-ray device used for the examination of metals provides views that not only show internal flaws, but indicate their distance from the surface of the metal as well. Former mathematical methods made possible the determination of this depth within, perhaps, a one-half-inch error factor. With the new device the error is less than one-sixteenth of an inch.



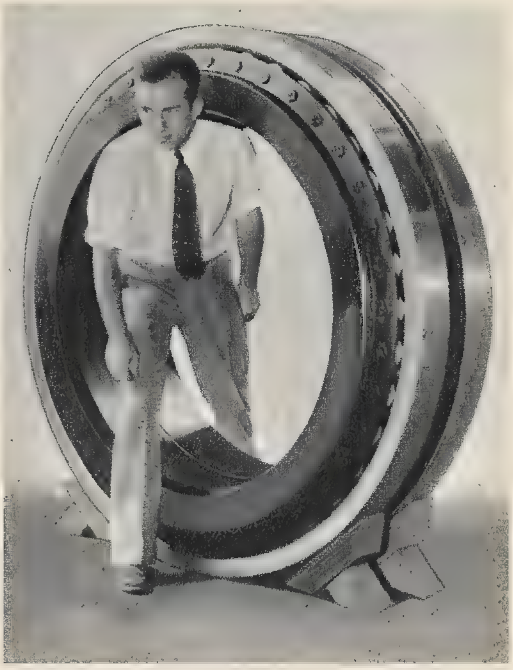
Instrument Measures Refracted Heat Rays

INTENDED to supplement existing weather bureau apparatus in foretelling fluctuations of temperature, a new instrument developed by Professor Charles M. Heck, head of the physics department of North Carolina State College, registers the temperature of the "re-radiation center" from which heat rays are refracted back to earth after having risen from the earth and been absorbed by the moisture in the air. The instrument consists of a thermometer set within a series of four aluminum "cups."

Cupboard's Shelves Revolve

A NEW portable food-cooling cabinet features five revolvable shelves, each resting on a bracket projecting from a metal post. Non-poisonous, odorless oil in cups prevents ants from reaching the shelves.

Build Giant Roller Bearing

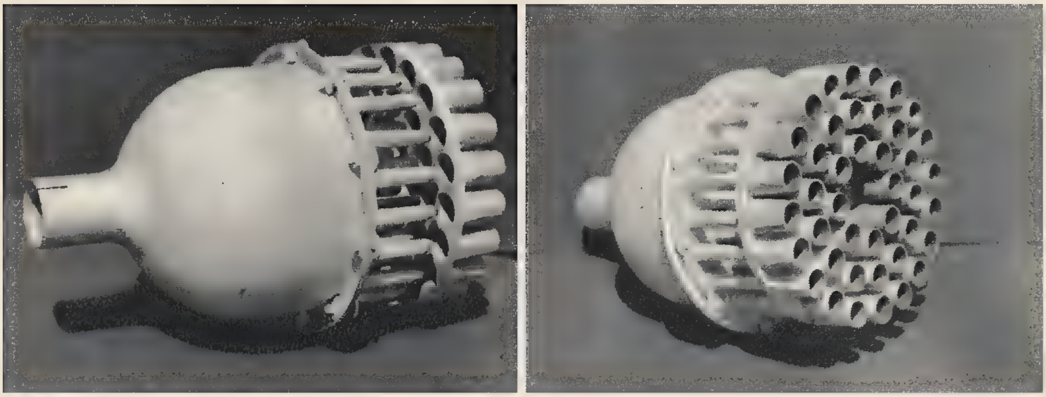


MANUFACTURED for use in a cement mill, the huge roller bearing shown above weighs nearly three tons and has an outside diameter of 61½ inches. The bearing has 78 rollers weighing 12¾ pounds each.

Portable Auto Basket Aids Fruit Peddler

FITTING into a rear recess of his automobile truck when not in use (inset photo), a six-wheeled metal basket developed by W. K. Gilmore, a fruit peddler in Pasadena, Calif., enables him to show his complete line of produce at his customers' back doors, thus helping to create sales. The portable container balances on two large center wheels while four smaller wheels at the ends facilitate climbing over curbs.

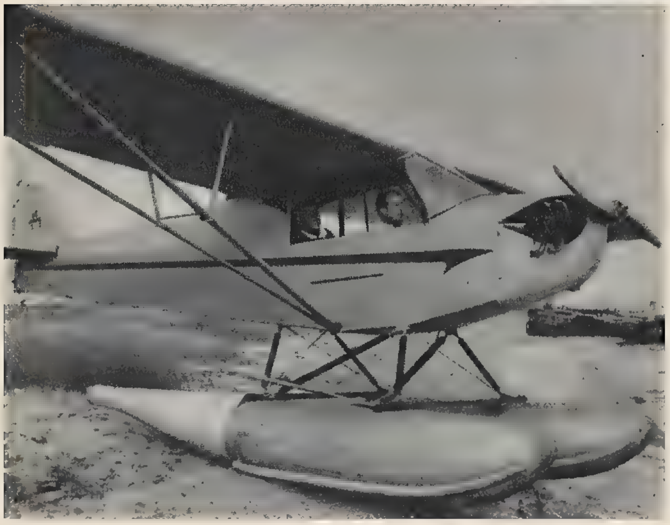
A list of addresses of manufacturers of all items mentioned in MECHANIX ILLUSTRATED will be sent to any reader upon receipt of a stamped, return envelope.



Device Makes Automobile Exhaust Gases Harmless

EASILY attached to the exhaust of an automobile, a patented exhaust oxidizing receiver device (above) is said to cause a dissolution of the carbon monoxide gases, reducing them to an absolute minimum so that they are harmless to human beings. During tests of the device, a live animal was subjected to the exhaust fumes of a running auto equipped with the receiver for a period of 60 minutes and blood tests of the animal failed to reveal any ill effects. It is believed that use of the device would eliminate the numerous cases of headaches, illness and deaths which are attributed to breathing carbon monoxide while motoring in heavy traffic or when warming up an auto engine in a closed garage.

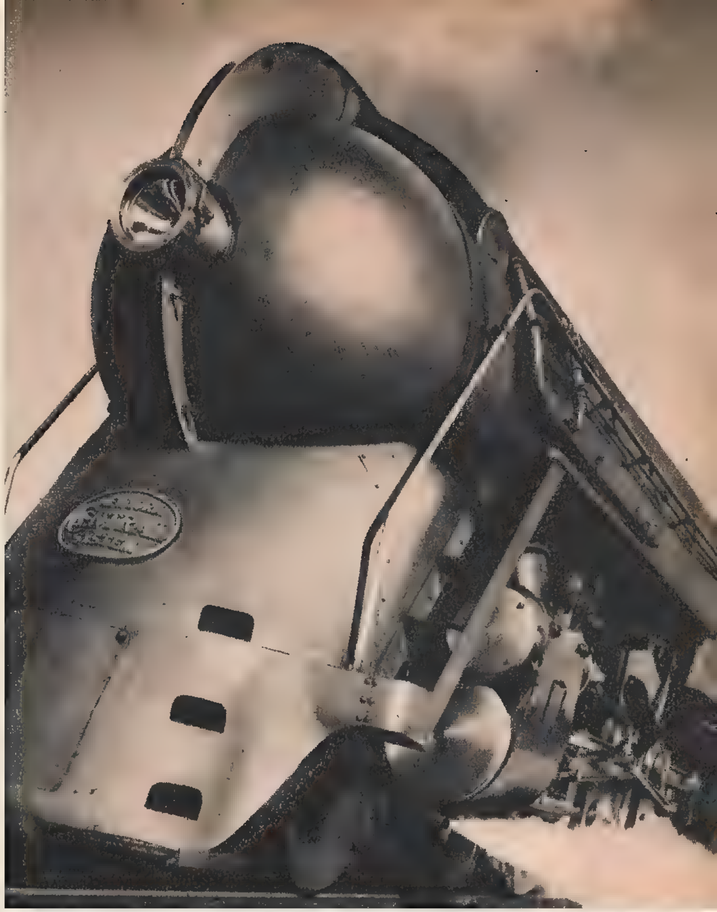
Test Rubber Plane Pontoons



INFLATED rubber pontoons may soon replace the conventional metal types used on seaplanes, according to experts who recently witnessed the first flight tests of an aircraft equipped with them (left). Each of the rubber pontoons has five compartments so that a puncture of one or two would not mean the collapse of the structure or sinking of the plane. The compartments have separate valves so that they can be inflated to any desired pressure with an ordinary bicycle pump, as shown above.

The New 20th Century Limited

SETTING new standards for comfort, beauty and luxury in railroad transportation, the new 20th Century Limited of the New York Central System operates on the fastest schedule—16 hours—ever made in regular service between New York and Chicago, flashing over the rails at speeds up to 80 m.p.h. The Limited consists of 62 cars and 10 streamlined locomotives operated in four sections. The train is the first all-room type in America, the sleeping cars consisting of roomettes, bedrooms, compartments and drawing rooms, there being no berths. The public cars—lounge, observation and dining cars—are all of new and unusual design, featuring colored lights, circular tables and attractive drapery, as shown in the accompanying photos. The new 20th Century Limited marks the 36th anniversary of the world-famous train's first run.



Streamlined Hudson-type locomotives pull the famous 20th. Century Limited (right).

From headlight to observation car the new Century is a "masterpiece of the rails." With its venetian blinds, chrome smoking stands, photo murals and other pleasing interior decorations, the observation car (upper left) is the last word in modern design. Curved settees add a distinctive note to the club lounge car (left), eliminating the usual long lines of chairs. The walls are made of brown cork with copper metal trim. More like a smart restaurant than a railroad diner is the Century dining car (above). The tables can be arranged informally in groups, if desired.

I Risk My Neck

Twelve years as a thrill driver hasn't dimmed the daredevil spirit of Flash Williams, (left) America's ace stunt man who tells what it's like to crash a speeding car or plane.

HOW would you like to drive an automobile through a burning house? Or sit at the wheel while your car, traveling at 75 miles an hour hits another auto going at the same speed, in a head-on collision? Or maybe, if this sounds too tame and unexciting, you would prefer to drive at terrific speed over a raised platform and then hurtle through the air for a distance of 65 feet.

These are everyday experiences for me. For about 12 years I've been risking my neck trying almost every dangerous stunt imaginable with automobiles, airplanes and motorcycles. Just for a lark I started flirting with death at a state fair in Texas in 1926. I've been at it ever since and claim to have invented practically every one of the ultramodern automobile and motorcycle crash stunts.

When not doubling for a famous movie star, crashing a plane for the films, or performing some other spectacular feat for the silverscreen, I'm likely to be found touring the country with my troupe of 8 "Thrill Drivers." Most of my stunts are performed from cars traveling at 40 to 75 miles an hour over raised platforms known as ramps. The ramps we originally used were 12 feet long and two feet high. Now they're 24 feet long and 3½ feet high—or approximately twice as big and high as they used to be. Which means, of course that my gang of daredevils travel about twice as fast and as far as in the old days and that our work is doubly dangerous. Many a time I have made my stunt car jump, with the aid of the new type of ramp, as far as 85 feet without turning over. I claim this is the world's record.

My newest and most spectacular stunt is the "race with death." First two cars, going

70 miles an hour, drive down the track parallel with one car about six feet in front of the other and slightly to one side. Now, while the one car travels up over the ramp at top speed, the other car cuts to the left in front of the ramp. Thus the first car performs a spectacular leap frog. The slightest miscalculation—even a fraction of a second—means a serious crash. But fortunately there has not been the slightest of accidents while performing this feat.

Probably the most dangerous show we ever used was the "eight man jump," which we performed regularly several years ago. Eight members of my crew would stretch out in front of the ramp and then I would drive over the platform, my car clearing the entire crew. But on one well remembered occasion my car performed a sudden swerve and struck one of my boys, breaking his ribs. Since then the stunt has been abandoned.

Today I'm especially fond of doing a new stunt called the "moon dip." In this I drive my car at 60 miles an hour over two ramps. This doesn't sound especially dangerous until you bear in mind that I run the car as far over as possible on two wheels without actually turning it over. Incredible as it may sound, I'm moving at a 45 degree angle!

I achieve this stunt by practice, but never outside of actual performing hours. I have one peculiar habit—I never rehearse a stunt. Instead I figure it out ahead of time with the most precise accuracy, then "shoot the works" with my fingers crossed, at my regular show.

One of my best known feats of yesterday was the "suicide leap." In this, speeding at 75 miles an hour, I made my car leap 75 to 80 feet, with the assistance of a large ramp. I quit doing this stunt not so long ago for the very good reason that it literally tears an

Opposite page: This spectacular stunt almost proved fatal to "Flash" Williams when he leaped too late and the car turned over on him. Below: Driving through a burning house at 75 m.p.h. is a hot stunt even for "Flash." Once his clothes caught fire and firemen saved him from roasting.

For A Thrill

by
Al (Flash)
Williams

This is the start of Flash's most spectacular stunt in which he drives a car off a ramp at terrific speed.

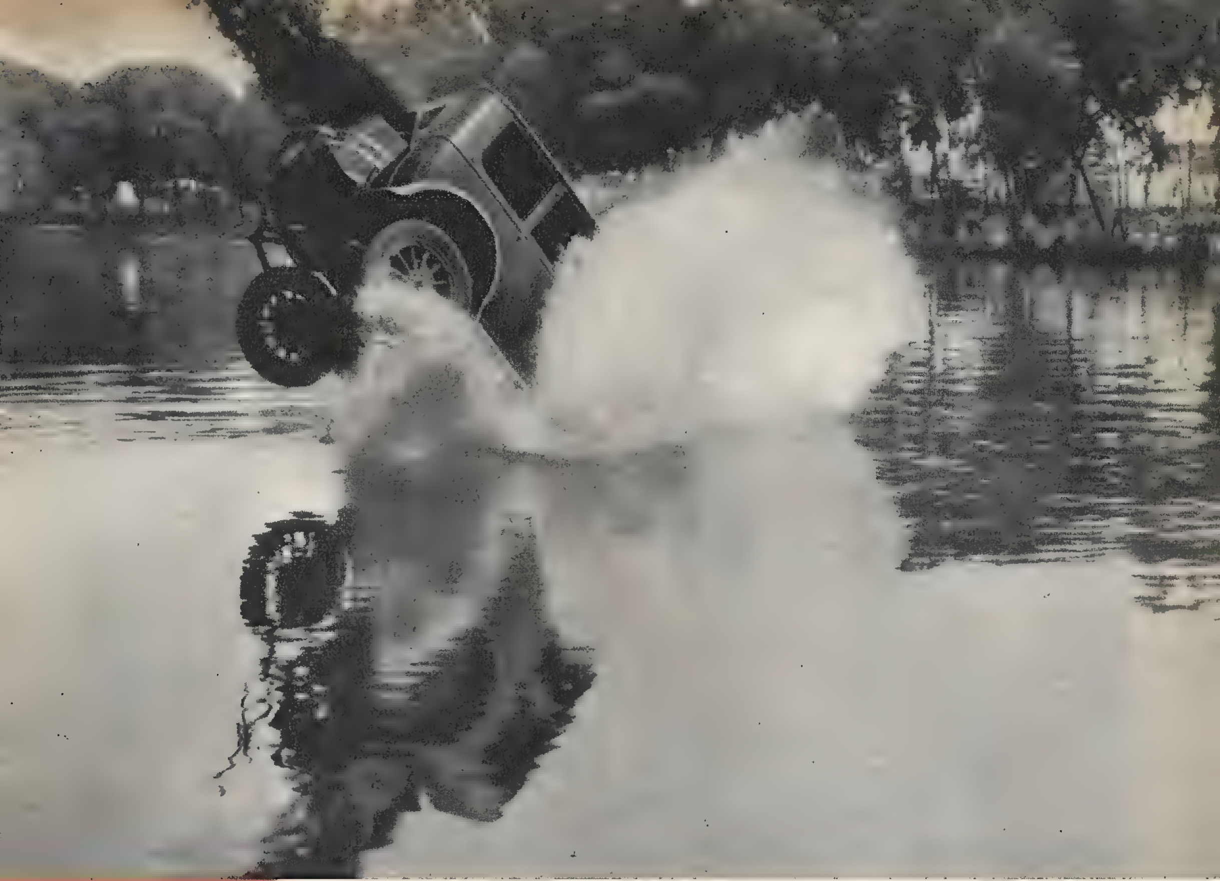
automobile to pieces. And that's too tough on the pocketbook. Incidentally, all of my crash cars are stock machines with no special equipment of any kind.

My greatest thrill? Never will I forget the "Return from Hell," stunt I used to perform more or less regularly several years ago while barnstorming at state fairs. But I gave it up. Why? Well, one time down in Big Springs, Texas, in the southwestern oil fields, we built a small "house" for stunting purposes. An automobile was placed in this and I was handcuffed to the wheel by the local sheriff. Thus if I was unable to drive the car out, I was just out of luck. Well, they boarded up the structure, poured 25 gallons of gasoline over it and set it afire. This, mind you, was back in the days when car's bodies were wooden and therefore highly inflammable. I stepped on the starter. The house lit up in an enormous flame. I drove halfway out and then, suddenly the motor died. Evidently the flames had choked up the carburetor, keeping out the much needed oxygen supply. There I was, trapped. Luckily the sheriff saw my predicament and with the aid of the local fire department, came to the rescue. He unlocked the handcuffs and I was able to get out only slightly burned. Do you blame me for never trying that stunt again?

Another close call I had was in Fort Wayne, Indiana, back in 1936. I was in an open roadster and doing a stunt called the "flaming wall crash." I had a new assistant on the show. He insisted he was an expert on throwing gasoline from a bucket onto flames in order to give the stunt a more spectacular appearance during the crash.

Well, I agreed to his suggestion, but instead of throwing the gasoline on the fire while I was speeding through the wall he threw most of it on me and on my car. And was I burned up? It scorched my ears, arms and legs and singed all the hair off my head. Fortunately these weren't second degree burns. But they were exceedingly painful and unsightly. An ambulance was rushed to the scene and I was scooted off to the nearest hospital. But I came back and finished the show.

Another thriller in the Hoosier state took place at a state fair about a year ago. This was during a carefully planned stunt—a head-on collision between my car and the one my brother Melvin was driving. The big idea was for both of us to jump out of



Leaving the ramp, the car hurtled 65 feet into the river. Flash was thrown through the rear window.

the cars at the precise fraction of a second that they crashed. The crash occurred exactly as per schedule but I didn't leave the car quite quick enough, whereas my brother jumped out at exactly the right moment and was unhurt. My machine turned over partially on top of me and scraped my head at the left temple. A fraction of an inch closer and it would have crushed my head like an eggshell.

Some of my accidents in Indiana have been too close for comfort. On August 7, 1937, only a near-miracle saved me from almost certain death, during a stunt never before attempted. I drove a car off a raised platform on the bank of the St. Joseph River at a terrific speed and hurtled through the air for 65 feet into the water. Striking the water at this high speed is almost as risky as crashing headlong into hard ground. The crash washed me clear out of my seat at the wheel into the rear of the car. A couple

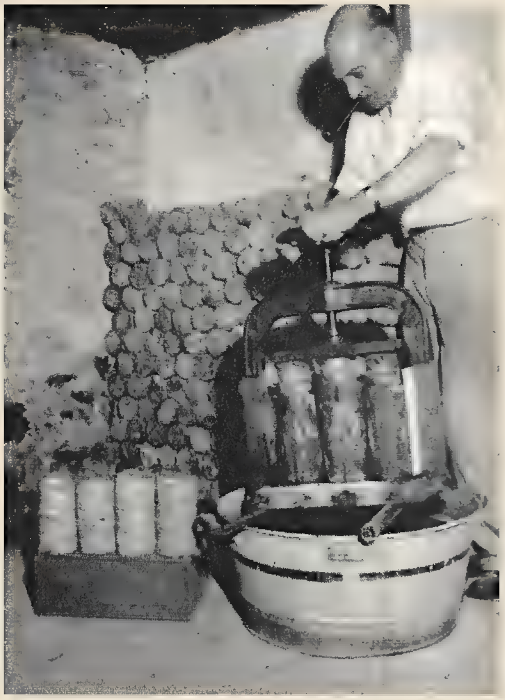
[*Continued on page* 139]

This is Flash's version of the motorcycle broad jump in which he clears a truck and another motorcycle.

Lamp Performs Three Jobs

A NEW triple-duty, floor lamp invented by E. G. Shinner, of Chicago, Ill., provides light, a cool breeze and traps night-flying insects. Directly above the light bulbs is a four-bladed, silent electric fan which is controlled by a rheostat. A removable screen atop the shade traps all kinds of flying insects attracted by the light.

Converts Paper Into "Logs"



USING a discarded office letter copying press and molds made from a 10-inch section of iron pipe of a four-inch diameter, John Ernest, of Hamilton, Canada, devised a press by means of which he creates fireplace "logs" from waste paper. The paper is pulped in a metal tub, placed in the molds and then compressed, as shown in photo.

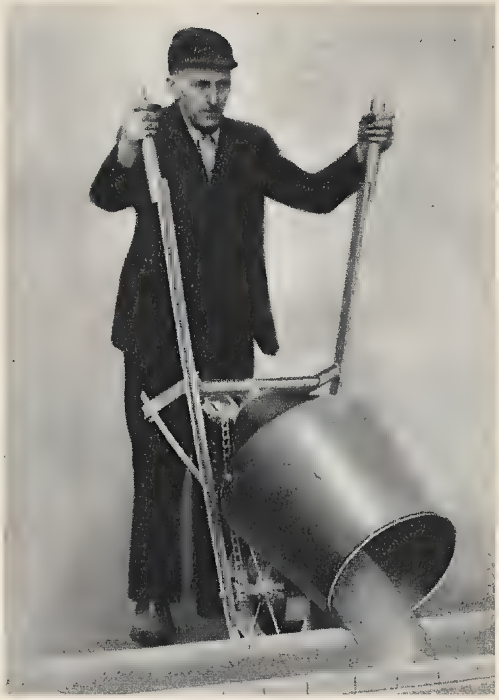
Famous Model Train Layout Moved

HAVING outgrown the space where it was first set up in 1929, the famous Union Connecting Railroad of the New York Society of Model Engineers was recently dismantled for removal to larger quarters in the same building on West 42nd St., in New York, N. Y. When reassembled, the miniature railroad layout will feature a 485-foot route from terminal to terminal. The trackage will be mostly O-gauge, but smaller OO- and HO-gauge layouts will be set up.

Machine Pits Cherries Clean

CAPABLE of pitting more than 60 cherries per minute, a new mechanically operated device is said to have a spoilage loss of less than two per cent. The pitter features a specially designed three-bladed knife that cuts the cherry pit loose and then pushes it out through the stem side.

Wheelbarrow Mixes Cement

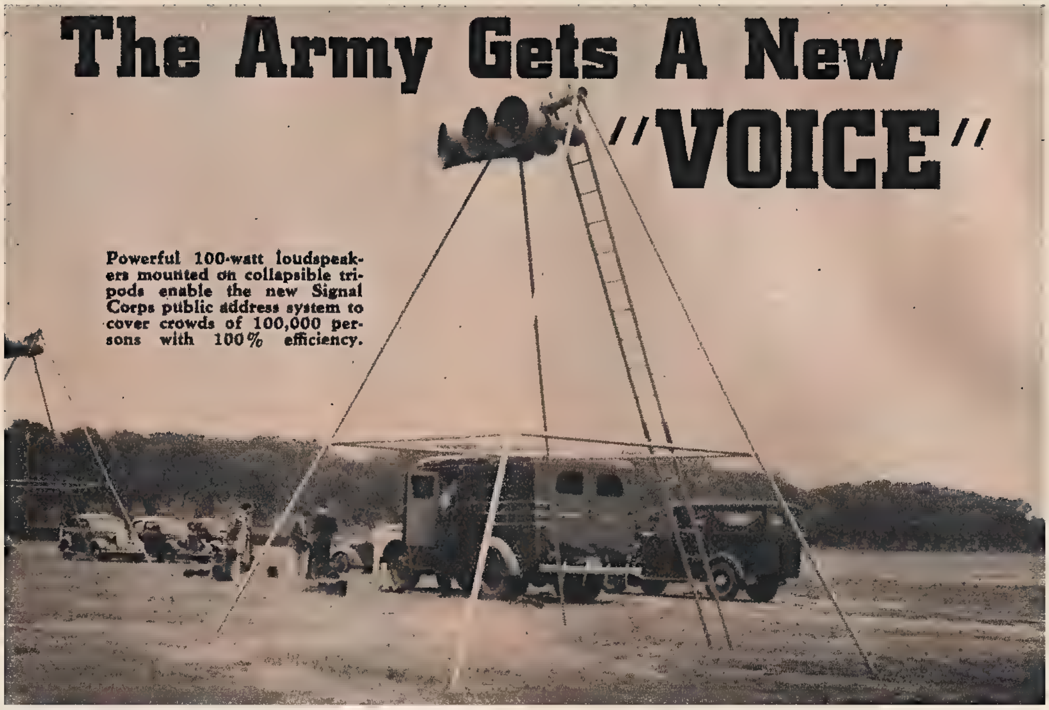


DESIGNED for use on small jobs, a new combination wheelbarrow-mixer thoroughly mixes a batch of cement while it is being wheeled 40 or 50 feet. The cement ingredients are simply dumped into the barrow's revolving drum which is geared to the pneumatic tired wheel by a sprocket chain.

Boots Protect Cattle Against Hoof Disease

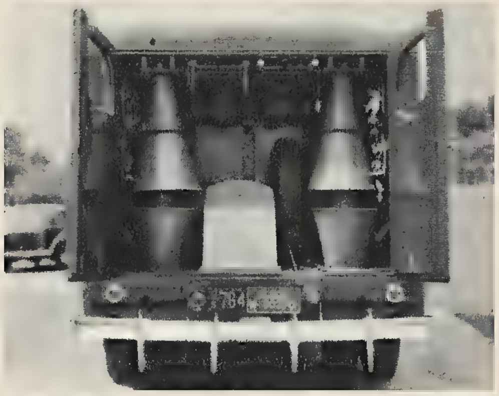
INTRODUCED at the Royal Agricultural Show held recently in Cardiff, England, laced rubber cattle boots are said to be very effective in helping to prevent the spread of the dreaded hoof and mouth disease that causes farmers to lose about 90 million dollars yearly. The young lady in the photo is shown adjusting a pair of the boots over the hoofs of a cow exhibited at the agricultural show. The novel boots are said to be inexpensive.

The Army Gets A New "VOICE"



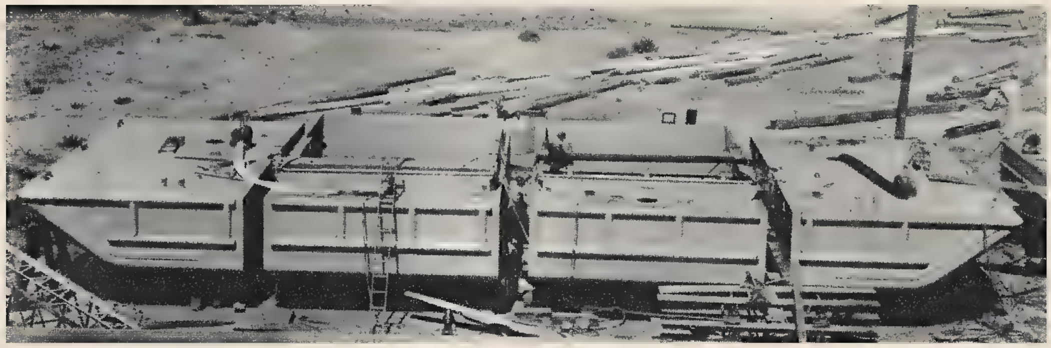
Powerful 100-watt loudspeakers mounted on collapsible tripods enable the new Signal Corps public address system to cover crowds of 100,000 persons with 100% efficiency.

OUTMODING the traditional "leather-lunged" sergeant, a new high-powered mobile public address system recently procured by the U. S. Army Signal Corps is capable of carrying the human voice clearly to an assembled audience of more than 100,000 persons. Manufactured in accordance with the specifications prepared by the Chief Signal Officer, Major-General J. O. Mauborgne, the system features two collapsible tripods, each of which supports three 100-watt loudspeakers. Power for the amplification apparatus is derived from a gasoline engine generator mounted inside a two and one-half-ton panel body truck. The truck carries all the sound equipment and is also fitted with two permanently mounted loudspeakers for covering assemblies of 5,000 persons or less, eliminating the need for setting up the tripod-mounted loudspeakers for such small gatherings.



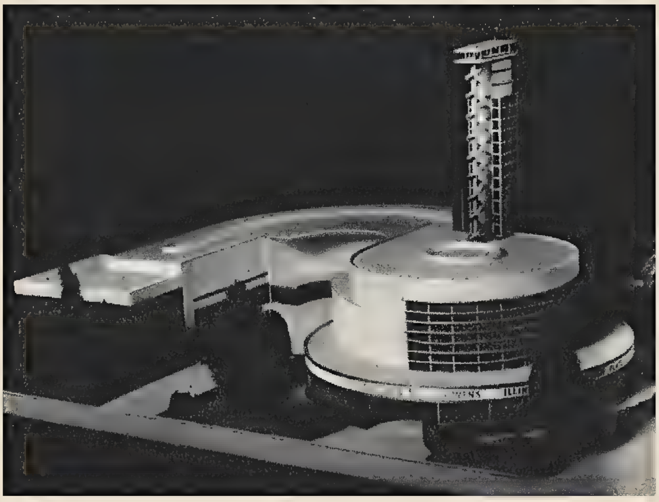
Left, above—Rear view of the mobile sound truck with loudspeakers packed for travel. The gasoline engine generator is in center. Left—The snub-nosed 2½-ton sound truck is examined by Major-General Mauborgne, the Army's Chief Signal officer.

Welded Scow Sections Bolted Together In Water



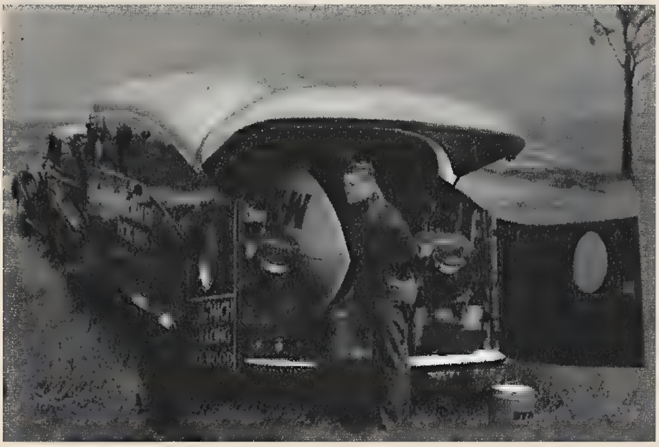
TO FACILITATE shipment to a point far away from the Pacific Coast plant in which it was fabricated, a new type of metal scow was constructed in four separate sections. Upon arrival, the sections were launched and then bolted together while in the water. Each of the four sections features arc welded construction with continuous seam welds. Photo shows sections during process of construction in Oakland, Calif.

Model Shows World's Fair Glass Center



CONSTRUCTION work on the Glass Center, a million dollar combined New York World's Fair exhibit of three leading glass manufacturers, has recently been started. As shown by the model, the building will be constructed primarily of glass and will occupy an area of 25,000 square feet. The tower, 108 feet high, will be constructed of blue plate glass and glass blocks.

Huge Trailer Serves As Home, Van



A HUGE automobile trailer constructed specially for Jack Wood, well known outboard racing pilot of Detroit, Mich., features living quarters in front, while the entire rear end opens up to accommodate storage of two outboard racing shells, motors, fuel and other racing gear. The trailer is supported by four wheels.

"Stocking Raincoat" Keeps Shoes And Legs Dry In Rain

MRS. BESS M. HEDGE, of Oklahoma City, Okla., who has more than fifty inventions to her credit, is shown putting on a "stocking raincoat," one of her inventions. Fastened in place with a zipper, it keeps both shoe and stocking dry. The "raincoat" is transparent, and can be rolled up into a small bundle when not in use.

Special Transmitter Sends Out SOS If Plane Crashes

THE device that Anthony Easton is working on is an automatic radio distress apparatus which, installed on an airliner, will instantly send out signals the minute the craft is forced down, even though it is wrecked. The apparatus will work continuously for four days, giving searchers an opportunity to take bearings on the signals.

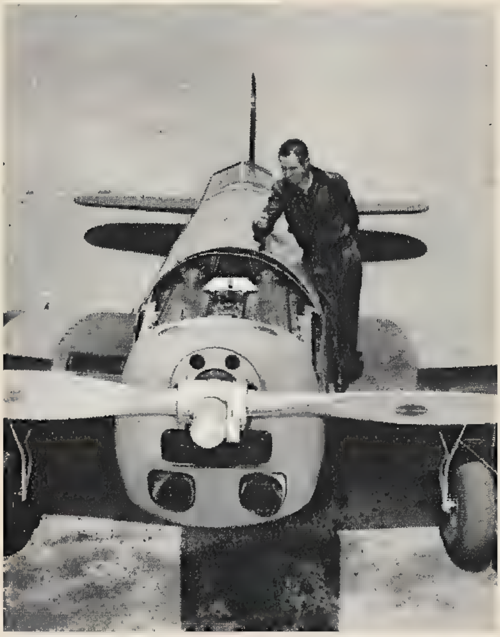
New Machine Gun Sets Firing Record

THIS new type of machine gun is said to be capable of firing 3,400 rounds of .45 calibre ammunition a minute, faster than any gun used by the United States Army. A seven-ounce recoil is one of the outstanding features of the gun. Compressed air is used to assist in the cooling of the barrel, the temperature of which is kept under 212 degrees. The inventor conceived the idea for the gun while serving in the army during the World War

Night Skiers Use Headlights

SKIING at night may soon become as popular as daytime skiing due to the invention of a new type of lamp which is worn on a leather strap around the head. The bulb socket of the lamp is connected by cables to a small battery carried in the pocket. Usually the stars and moon give off enough light to make night skiing possible, but the lamp is particularly valuable when passing through thickly wooded sections or when pausing to tie a ski strap.

Plane Has United Engines



A NEWLY developed airplane is powered with two 260-horsepower motors united side-by-side in its nose and geared to a single propeller operated by a free-wheeling clutch. If either engine should fail, the remaining motor twirls the propeller without drag from the dead unit, eliminating the necessity for making a forced landing. Harry Downes, test pilot for the firm that designed the plane, is shown inspecting the engines before taking the plane aloft for flight tests.

Miniature Locomotive Hauls Two Persons

BURNING coal and generating 100 pounds of steam, a model locomotive constructed by E. K. Freeman, of Los Angeles, Calif., is capable of hauling the weight of two persons on small flat cars, as shown in photo. An exact scale reproduction of a Baltimore and Ohio Railroad locomotive, the miniature engine is used on Hollywood movie lots to make realistic scenes calling for "iron horse" activities.

The Mummy Cloth

IT PUZZLED science for 56 centuries! The Pharaohs knew its secret; they grew the ramie plant and made ropes and mummy cloth from its fibre. The Orientals—Asiatic nomads, followers of Confucius and Genghis Khan, harvested the ramie plant, separated its fibres from the stalk and wove beautiful textured cloth, made ropes and mats, wall coverings and decorations. They did this work by hand—slowly and laboriously. They knew it by various names in different lands; called it iron-cloth, rhea, China grass, glass-cloth, kari-mushi and tsut-ma. For 56 centuries it baffled time's attack.

But today ramie, the oldest known textile fibre, is on the brink of succumbing to mechanization. Scientists and engineers have at last cracked the secret of its manufacture and machines that separate the fibre from the stalk and weave it for commercial use are already in operation.

Ramie is the most durable, strongest and lightest vegetable textile material extant. It is 8½ times stronger than cotton, 6 times stronger than silk and 4 times stronger than flax or hemp. It is less crushable than linen and so durable that the average business man will be unable to wear out a suit made from ramie (or mummy) cloth. It is claimed that future parachutes made of this material will be 6 times stronger but will weigh half as much as the best material now in use. These improved 'chutes will neither mildew nor rot and may be packed in storage indefinitely without danger of deterioration. Similarly, potential airplane cloth will weigh less and last longer. Industrial belts—made of ramie fibre—90 percent are now manufactured of cotton impregnated in rubber—will neither stretch nor shrink. Ropes, fish lines, nets and sails of ramie will withstand from 75 to 100 years of the hardest wear and tear.

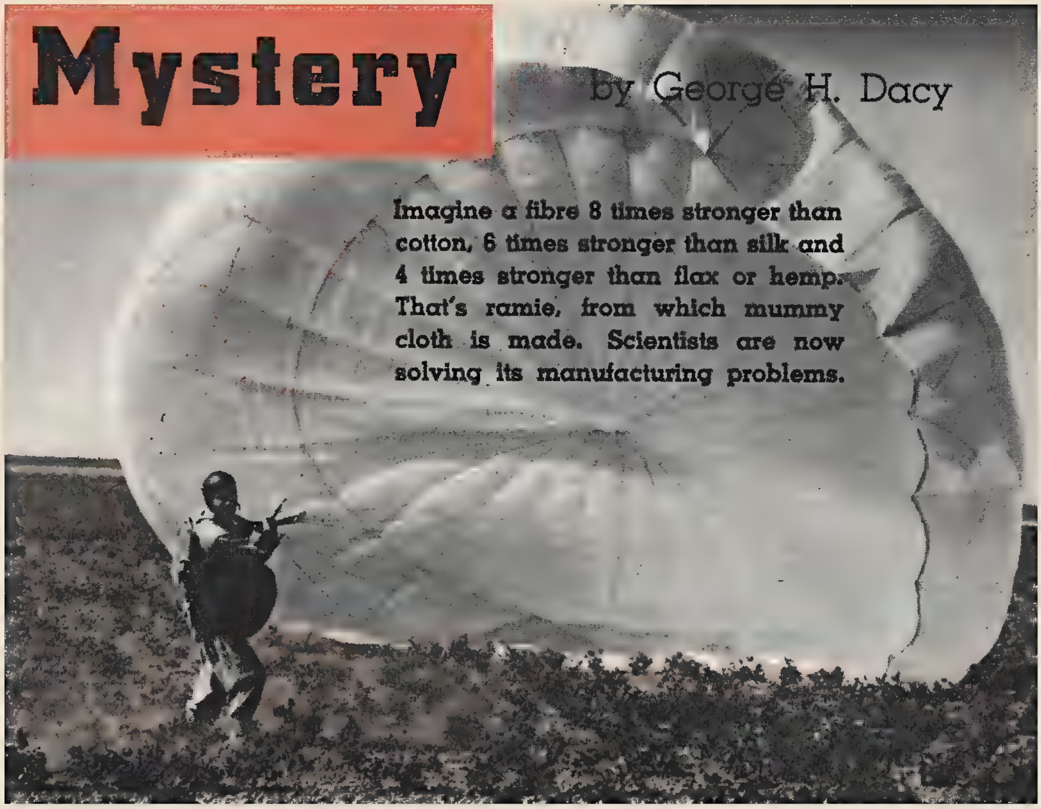
Charles R. Dodge, former special agent of the U. S. Department of Agriculture, writes that ramie has three times the strength of Russian hemp, while its filaments can be separated almost to the fineness of silk. It may be spun in various textile machines and

Left—65-acre ramie experimental farm at Live Oak, Fla. Above—The full-grown plant is 7 ft. high, ½ in. thick.

Mystery

by George H. Dacy

Imagine a fibre 8 times stronger than cotton, 6 times stronger than silk and 4 times stronger than flax or hemp. That's ramie, from which mummy cloth is made. Scientists are now solving its manufacturing problems.

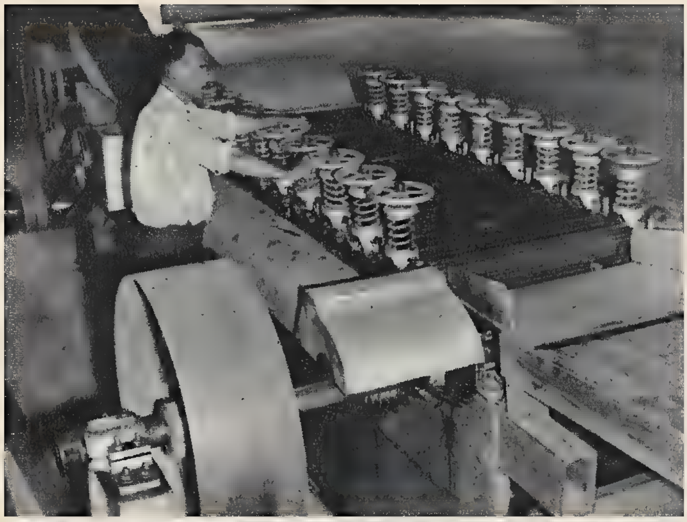


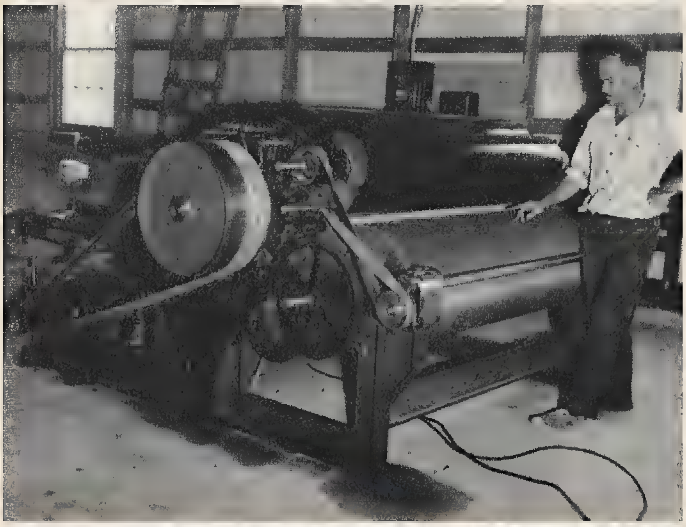
Parachutes made of ramie cloth will be six times stronger and half as heavy as the present silk in use, it is claimed. Zeiss photo.

is used in association with cotton, wool and silk in spinning, being an excellent substitute in certain manufacture for all of these textiles as well as for flax where great elasticity is not essential. It produces superior paper and is used for banknote paper because of the fineness of its pulp. The fibre may be dyed in all desirable colors and used for tablecloths, napkins, plushes, upholstery, curtains, carpets, dress and knit goods.

Dr. G. L. Carter, fellow in the Institue of Research of Louisiana State University, and Dr. P. M. Horton, assistant director of the Institute, in a jointly published paper on ramie, issued in 1936, pointed out that because of the high tensile

Left—Ramie fibre looks like sheep's wool. As cloth it is cooler than cotton and less crushable than linen.





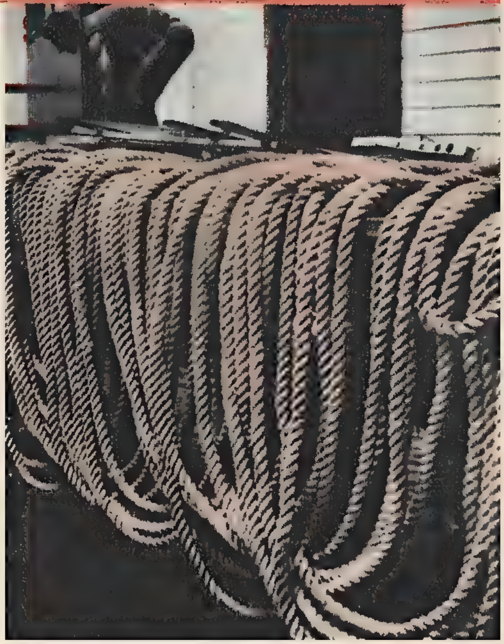
Left—This breaker with corrugated rollers and pressure jacks separates the hurds from the ramie plant which it breaks into 2 and 3-in. pieces. The decortication machine below it separates the ramie fibre from the plants and cleans it for spinning.

strength and resistance to moisture, 50 percent ramie mixed with wool decreases the shrinkage from about 25 to less than 10 percent. Fabric made from ramie is said to be cooler than cotton and thinner than linen. Dyed ramie fibre is equally as resistant to laundering, sunlight or the rays of a mercury lamp as cotton. Ramie is mixed with wool in the manufacture of hats, it is woven with silk, rayon, linen, cotton, and wool in the manufacture of dress goods. Filter cloth made of ramie is unusually satisfactory because of its great strength and wearability. It is also finding favor as a filter cloth in the air-conditioning industry, especially because of its hairy nature in the unmercerized state. Its strength is not impaired by wetting.

Ramie eclipses cotton in heat-resisting properties and promises to play a major role in increasing the wearability of automobile tires. The average rubber on an automotive passenger bus during a round-trip from New York to Los Angeles will stretch approximately 20 percent because of its content of cotton. Such stretching necessarily shortens its useful life. Substitute ramie fibre for cotton in the manufacture of "shoes" for motor vehicles

Left—Modern methods of processing will make it possible to spin ramie on a mass-production basis—a far cry from the tedious hand methods practiced by Egyptians centuries ago and by Chinese today. Zeiss photo.

Ramie, sometimes known as mummy cloth, is an ideal material for sails, experts claim, because of its light weight and greater strength and resistance to mildew. Its fibre is reported to be 4 times stronger than flax or hemp. Rope like that below is being made from ramie in European countries. Zeiss photo, below.



and you will eliminate this stretching, so the technical story goes. This means increased mileage and lower wheeling costs.

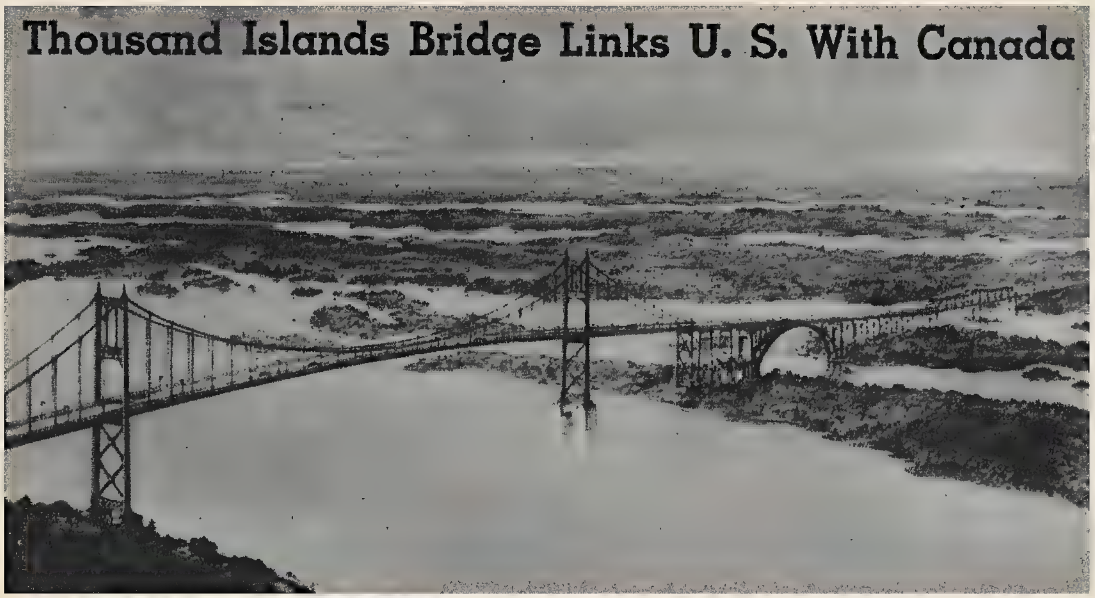
And so the story of ramie goes on. It is one of romance and wonder-work. Two thousand year-old samples of this textile, known from the time of the early Egyptians as mummy cloth, are now preserved in the National Museum in Washington, D. C.

Known to textile laboratory workers for years, the problem was one of manufacture. As early as 1869 the Government of British India offered a reward of $25,000 for a machine which would decorticate ramie (separate fibre from the stalk); four machine trials were conducted by the French Government between 1888 and 1894, but none of the mechanical devices proved practical. Ramie commercialization was attempted in Algeria, Egypt, Belgian Congo, Cuba, Mexico, Guatemala, and India—but failed. Ramie is now grown commercially only in China and Japan where cheap hand labor is plentiful, patience unending, and time measured more in terms of centuries than in hours and days. In India ramie is raised on some scale by fishermen who use the fibre in handmade fishing nets, lines and sails. A leading American manufacturer of agricultural implements is reported to have expended over $100,000 in efforts to develop a successful and economical machine for decorticating ramie.

One of the latest, and according to reports, most successful efforts to devise a decortication machine is the work of Colonel

[*Continued on page* 143]

Thousand Islands Bridge Links U. S. With Canada



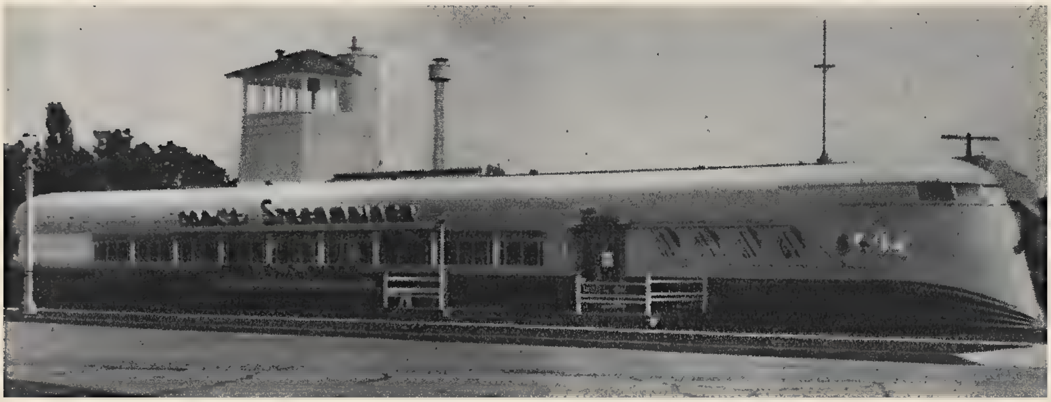
The drawing above, made by Robinson and Steinman, consulting engineers, clearly shows the new bridge's graceful lines.

Above—View of one of the bridge's continuous truss sections.

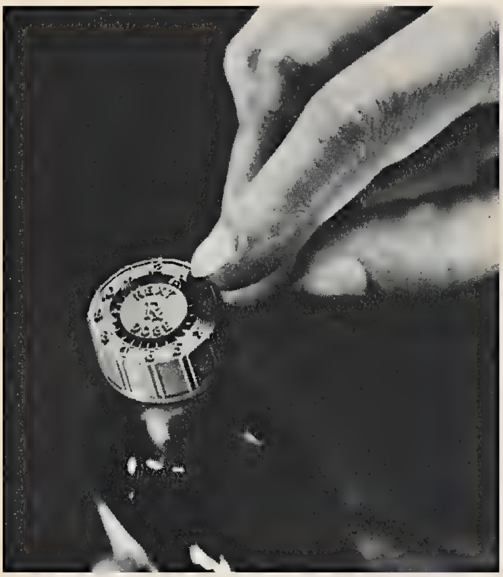
Top—A section of bridge's deck being swung into place. Lower photo shows a 348-foot steel arch being assembled.

REPRESENTING a cost of $2,200,000, the newly constructed Thousand Islands Bridge which connects Collins Landing, N. Y., with Ivy Lea, Ontario, Canada, commemorates a century of peace between the two nations. The bridge actually consists of five separate spans and approaches totaling eight and one-half miles—two graceful suspension bridges over the wide American and Canadian channels of the St. Lawrence River, a 348-foot steel arch between two wooded islands, a 600-foot double truss bridge, and a 90-foot concrete and masonry span crossing the International Boundary. It is estimated that more than 200 of the Thousand Islands can be seen from an automobile traversing the bridge and its approaches.

Restaurant Design Resembles Streamlined Train



CAPITALIZING on the popular appeal of the new streamlined trains, the owner of a restaurant in Los Angeles, Calif., had the outside of his diner designed to resemble a modern "iron horse" (above) and car.

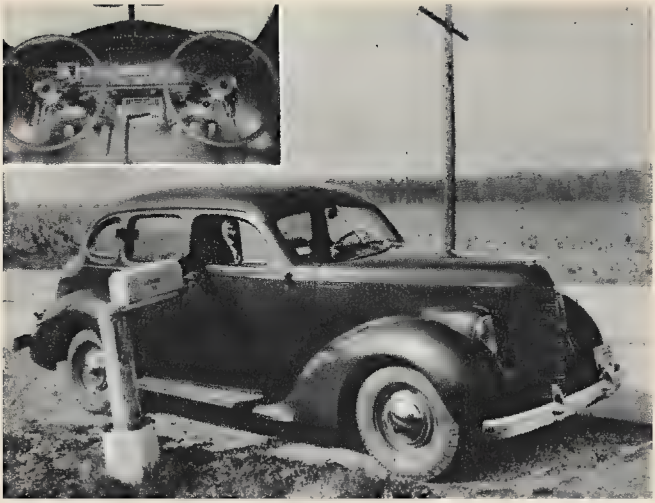


Clock-Faced Medicine Bottle Top Tells When Dose Is Due

AVAILABLE in sizes to fit all standard medicine bottles, a new cap features a clock-like face fitted with a ball bearing indicator which can be set beside any numeral on the face, thus indicating when the next dose is to be taken. The bearing moves around the bottle in a circular groove at the slight pressure of the finger, but will not change position accidentally. The cap is specially handy when a person is taking more than one medicine at different times.

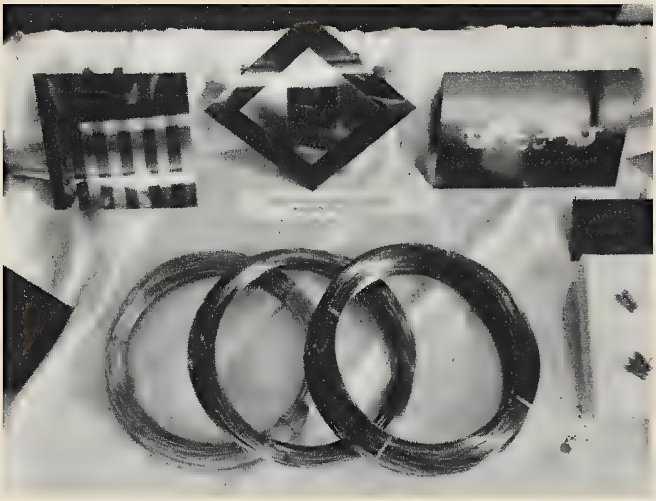
Biggest Continuous Oil Well Casing Set Up

CLAIMED to be the longest continuous casing ever set, an oil well casing recently placed in operation near Milroy, Okla., is 8,100 feet long. The casing sections were welded together (right), line-up clamps holding the sections together until the weld (extreme right) was completed. In tests, the welded joints successfully withstood an air pressure of more than 1,200 pounds.



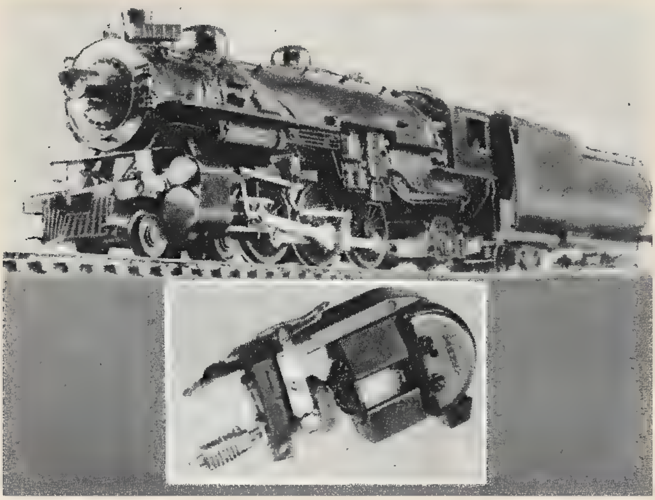
Dual-Controlled Auto Aids Mail Carriers

FACILITATING the work of rural mail carriers by eliminating the bother and time involved in sliding back and forth across the driver's seat when servicing mail boxes set up along the right side of a road, a well known make of automobile can be purchased with dual steering wheels, brakes and foot controls (inset). The dual-control car is identical to the type used for teaching driving to new motorists.



New Process Colors Stainless Steel

A WELL known steel manufacturing firm has developed a new process for coloring stainless steel in which the coloring is not merely applied, but actually processed into the steel itself with no adverse effect upon its stainless properties. The color tones made possible by the process run a wide scale, ranging in fine gradations from a light yellow to a slate grey so dark as to be almost black.



Model Locomotive Motor Is Powerful

A NEWLY developed motor for model railroad locomotives features a powerful magnet made of a nickel-aluminum-cobalt alloy metal, and is said to provide greater pulling power than motors much larger in size. The new motor is only 2½ inches long from the end of the shaft to the heel of the magnet. An idea of its power can be gained from the fact that a load of 7½ pounds is required to keep the wheels from spinning.

Scale-Model Warship Thrills Children

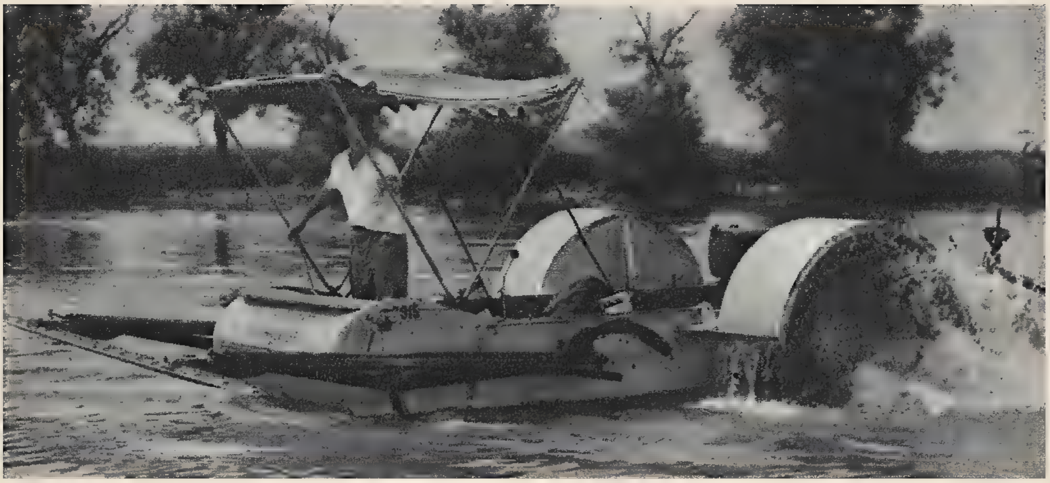
CONSTRUCTED by Joseph T. Drummond, of Washington, D. C., a working model of the battleship *Texas* provides much pleasure for children of naval officers at the U. S. Naval Academy in Annapolis, Md., when they take their daily swimming lesson in the academy pool. The model is six feet long and is complete in every respect, including a miniature airplane catapult located amidship.

Army Air Corps Gets Speedy Crash Boat

DEVELOPED for use by the Army Air Corps on service in Hawaii, a new rescue boat is powered by twin 12-cylinder 600-horsepower engines and can attain a speed of 31 m.p.h. The craft's forward cabin houses a powerful two-way radio apparatus while the aft cabin is fitted out as a medical dispensary with six litters. A small derrick facilitates the handling of airplane wreckage.

Road Surface Tinted To Match Terrain

TO BLEND the road with surrounding terrain, the famed Star and Garter Hill in Richmond, Surrey, England, is being resurfaced by an entirely new method whereby after concrete is laid to provide durability, a broken texture is added by vibrating granite into the surface. Pink granite is used to provide a tinted effect. After the road is laid, the surface is tamped down and brushed with stiff brooms.



Home-Built Water Machine Mows, Collects Seaweed

A SAW-TOOTHED mower that collects troublesome weeds from waterways has been invented by George Sanger, of Rockwood, Mich. The novel machine-boat required seven years to build and is propelled by paddle wheels driven by a gasoline engine.

Headgear Holds Eyeshield

CONSISTING of a light, comfortable headgear to which is attached an adjustable assembly fitted with a lens frame and two side projection members, a new industrial device affords the wearer eye protection while welding, brazing, etc. (lower left). The entire assembly can be pushed up out of the way when not in use (left).

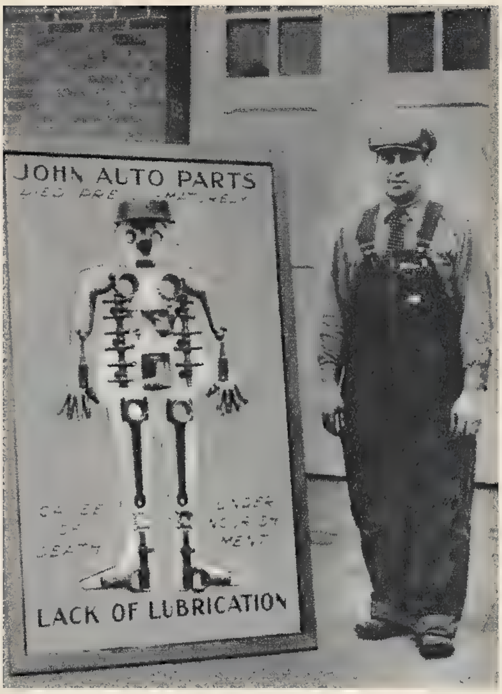
Builds Novel Model House

A NOVEL model house constructed by Francis Marten, of Waterbury, Conn., features a small wind charger assembly for generating electricity and an anemometer device for gauging the velocity of the wind.

New Lightweight Automatic Ironer Weighs 25 Pounds

THIS portable electric ironer weighs but twenty-five pounds and can be carried easily to any part of the house for convenient use. The device will handle all types of work from the most delicate fabrics to the most intricate ruffled curtains.

Worn Auto Parts Skeleton Shows Need For Lubrication



WORN parts from a discarded automobile mounted on a board to represent a skeleton as a lesson in the need for correct lubrication for automobiles, reminds patrons in a Green Bay, Wisconsin, gas station not to overlook the value of oil and grease in their cars.

Stratosphere Chamber Gives 65,000-Foot Altitude

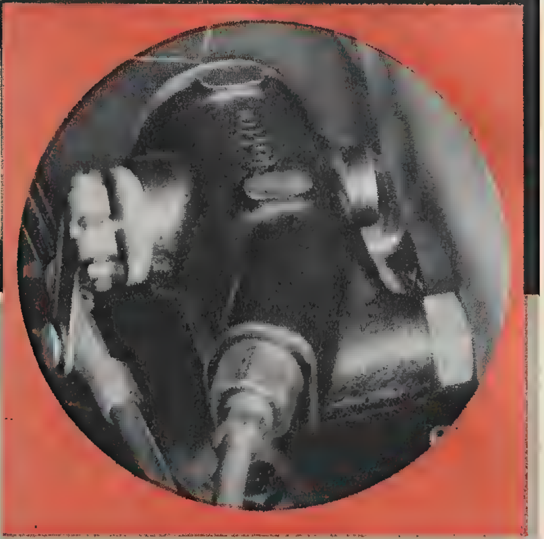
UNITED
AIR LINES

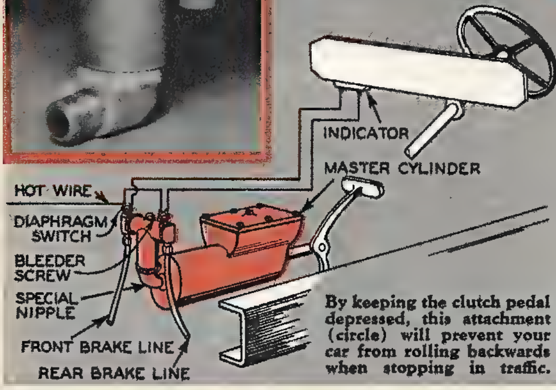
THIS new "stratosphere" chamber is being used at Chicago Municipal Airport for testing high flying conditions without anyone leaving the ground. The one-and-a-half-ton unit is capable of duplicating flight conditions as high as 65,000 feet. At the left is shown a view of the inside of the chamber while oxygen apparatus is being tested.

New Accessories for Old Cars

If you forget to turn on your headlights, these special reflector rims (above) will reflect light from oncoming cars.

No more accidents due to hydraulic brake fluid losses will occur with this safety valve attached (left).



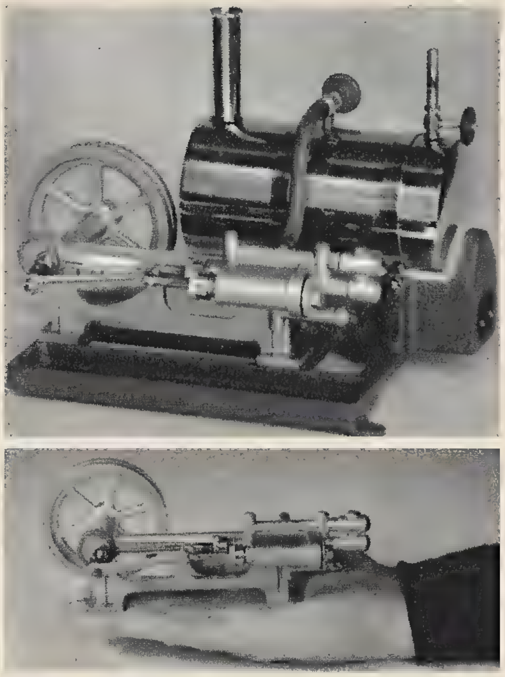

INDICATOR
MASTER CYLINDER
HOT WIRE
DIAPHRAGM SWITCH
BLEEDER SCREW
SPECIAL NIPPLE
FRONT BRAKE LINE
REAR BRAKE LINE

By keeping the clutch pedal depressed, this attachment (circle) will prevent your car from rolling backwards when stopping in traffic.

MANY features that were exclusive on 1938 cars and which will be incorporated in the new 1939 models are also available as accessories for older cars. You can now buy chromium fender guards to dress-up your car. A hill-holding device to prevent cars from rolling backwards when stopping on a hill for traffic, once exclusive, is now available for every car owner. For 1939 safety, you can buy special reflector rims that reflect amber light when rays from oncoming headlamps strike them. These are only a few of the accessories which the older cars will wear in 1939.

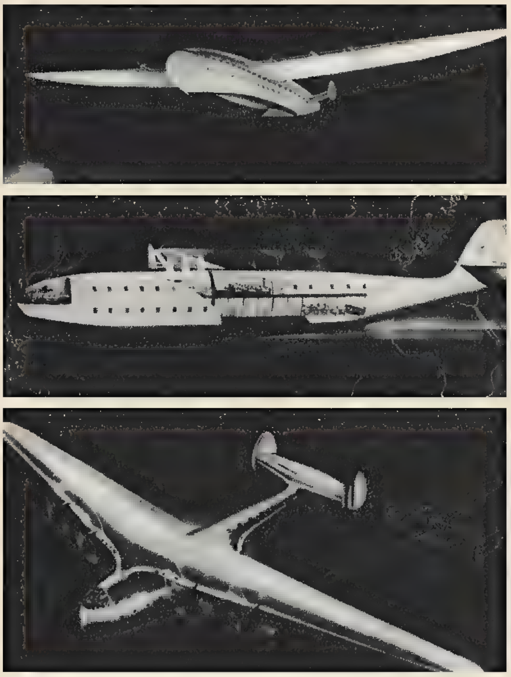
Smart fender guards, exclusive on 1939 custom-built models, are also available for older cars.

Model Engine Is Reversible



DESIGNED specially to drive small working models, boats, airplanes and other toys, a newly developed miniature steam engine can be run in either direction merely by changing the intake and exhaust lines. The small engine is of the single-acting oscillating type and, under various pressures, develops 2,000 to 4,000 r.p.m.

Designs Show Future Planes



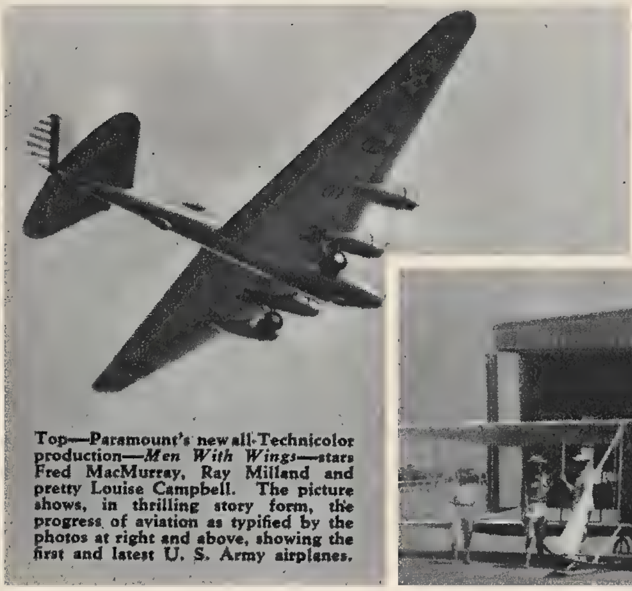
SHOWN above are drawings submitted by three well known aircraft manufacturers in response to the invitation of Pan American Airways for bids for the design and construction of transoceanic planes capable of carrying 100 passengers, a crew of 16 and five tons of baggage and featuring a non-stop range of 5,000 miles at 300 m.p.h.

Plug-In Welder Unit Supplies Varied Heat

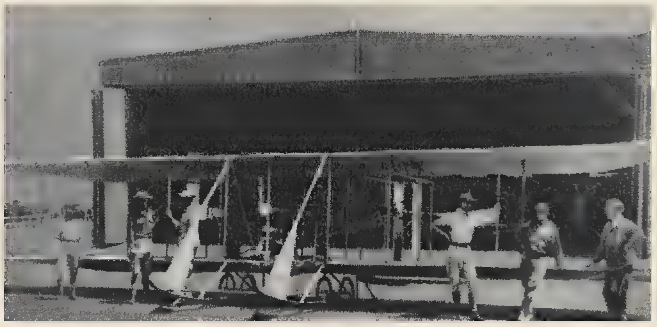
QUICK changes from one heat intensity to another are possible with a new type of plug-in welder. No dials or switches are employed, an electrical connection merely being plugged from one slot on the control board to another when a change of heat is desired. The control board consists of ten slots representing amperages of from 25 to 300 and is said to be protected against the possibility of accidental short circuits. The unit is housed in a portable cabinet.

WIN AN AIRLINE

In MI's Nation-Wide



Top—Paramount's new all-Technicolor production—*Men With Wings*—stars Fred MacMurray, Ray Milland and pretty Louise Campbell. The picture shows, in thrilling story form, the progress of aviation as typified by the photos at right and above, showing the first and latest U. S. Army airplanes.



HOW would you like to win a free round-trip flight on one of America's leading airlines to Hollywood, California, where you will meet some of the famous motion picture stars, be escorted through the Paramount Pictures studios, and be taken on a tour of the Douglas Aircraft Company in Santa Monica, where the huge DC-4 42-passenger airliners are constructed? Well, this four-point treat is first prize in the "Men With Wings" Contest being sponsored by MECHANIX ILLUSTRATED and Paramount Pictures and you have just as much chance to win it, or the twenty other excellent prizes which will be awarded, as anyone else. There are no frills to this contest, nothing difficult or "tricky." All that is required is that you answer ten simple aviation questions as listed on the next page and write a 25- to 50-word letter.

The contest questions are based on historical aviation facts which are shown, or referred to, in Paramount Pictures new production—"Men With Wings"—the first all-Technicolor aviation motion picture ever filmed, starring popular Fred MacMurray, Ray Milland,

TRIP To Hollywood
"Men With Wings" Contest

Men With Wings **provides a glimpse into the future when giant aircraft, like the proposed 100-passenger Sikorsky flying boat (above), will be commonplace. Right—A thrilling World War air battle scene from the motion picture.**

and Louise Campbell, and directed by William Wellman. Of course, since the questions are based on actual facts, you can look up the answers in standard reference books, but it won't be half as much fun as seeing the picture at your local theater and learning the answers from its thrilling and colorful scenes.

Starting with the first successful flight of the Wright brothers, the picture portrays in a stirring story form the progress of aviation from those days of bamboo and bailing-wire structures to the sleek-looking, all-metal "flying fortresses" of today. In fact, the story takes us a step further, providing a glimpse into aviation of the future. Throughout the picture there are thrills galore—crashes and struggles of the early pioneers, sky-battle action of World War days, trans-Atlantic flights, test piloting, etc.—*all in Technicolor!*

This thrilling motion picture records the feats of such famous flyers as Bleriot, first man to fly the English Channel; Alcock and Brown, first men to fly across the Atlantic; Lindbergh, first man to fly solo across the Atlantic; Wiley Post, first man to fly solo around the globe, thus helping you to choose a subject for your short letter on "Who Is Aviation's Greatest Hero?" as required in the rules listed on this page. Of course, you may feel that Douglas, Martin, Seversky, or some other famous aircraft designer is aviation's

[*Continued on page* 142]

CHECK ONE SQUARE FOR EACH QUESTION.

1. The first successful airplane flight was made by the Wrights on December 17, 1903 ☐ December 17, 1907 ☐
2. The United States Army had no airplanes before the World War Yes ☐ No ☐
3. When Alcock and Brown made the first successful flight across the Atlantic Ocean they landed in Long Island ☐ Newfoundland ☐
4. Colonel Charles Lindbergh started his famous trans-Atlantic flight from Orchard Beach, Maine ☐ Curtiss Field, L. I. ☐
5. The name of Colonel Lindbergh's monoplane was Winnie Mae ☐ Spirit of St. Louis ☐ Old Glory ☐
6. The early pioneers were more interested in the development of the airplane as a means of transportation than in its possible value as a weapon of war Yes ☐ No ☐
7. The first scheduled air mail planes were flown by U. S. Army pilots Yes ☐ No ☐
8. Commercial pilots must first serve as test pilots Yes ☐ No ☐
9. Corrigan flew to Ireland with the aid of a "gyro-pilot" and other modern direction-finding instruments Yes ☐ No ☐
10. Wing flaps were invented to make an airplane fly faster Yes ☐ No ☐

Name and Address ....

.... Age ....

After checking off your answers to the above questions, tear out this coupon (or make a copy of it) and send it, together with your 25 to 50 word letter on the subject—"Who Is Aviation's Greatest Hero?"—to Contest Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

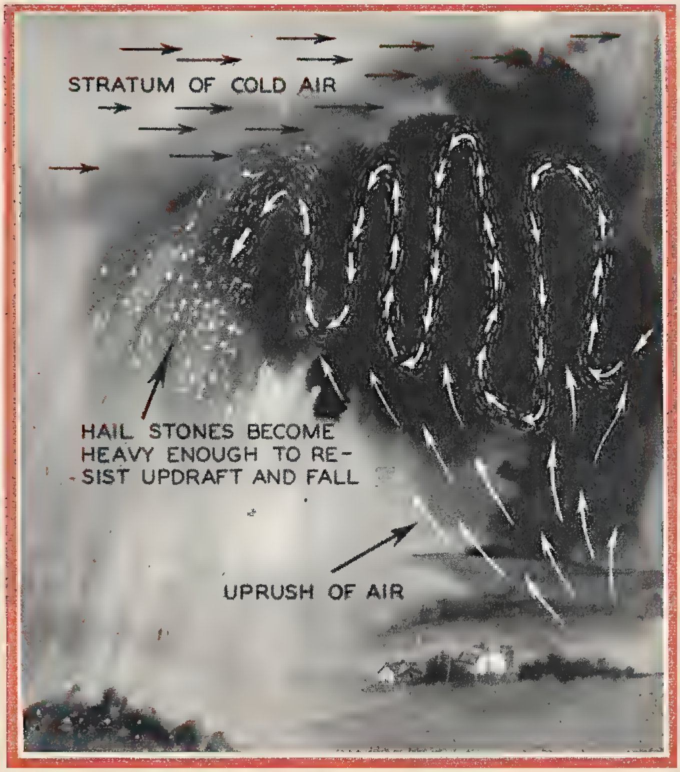
HAIL

This story is about hailstones as big as tennis balls that fall from heaven in the world's worst storms.

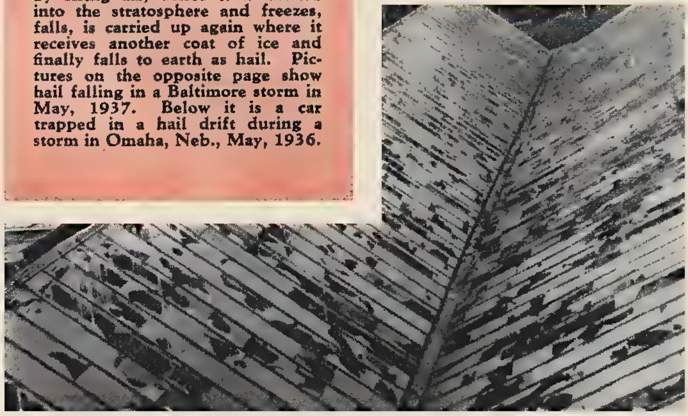
by J. McQueeny

HOW would you like a hailstone as big as a baseball to whack you on the head? Or would you prefer the experience of having a shower of hailstones three times the size of eggs come crashing through the roof of your car or home? This is not mere conjecture. It has actually happened. Authentic records of hailstones the size of golf balls have been more or less common. Likewise, there have been a few cases where they might have been mistaken for baseballs, and, in at least two instances, proof of ice chunks having fallen from the heavens that were comparable only to grapefruit. For the largest apparently authenticated single hailstone, S. D. Flora, U. S. meteorologist for Kansas, nominates the one that ripped through a tile roof of a house in Heidgraben, Germany, on August 19, 1925. It measured 9¾x5½x4½ inches and caused such a flurry of excitement

FROM HEAVEN


STRATUM OF COLD AIR
HAIL STONES BECOME HEAVY ENOUGH TO RESIST UPDRAFT AND FALL
UPRUSH OF AIR

Above: Hailstones thrice the size of eggs fell in Illinois in 1929. Below: Hail caused considerable property damage as this roof shows. The drawing illustrates how falling rain is carried upward by rising air, where it is carried into the stratosphere and freezes, falls, is carried up again where it receives another coat of ice and finally falls to earth as hail. Pictures on the opposite page show hail falling in a Baltimore storm in May, 1937. Below it is a car trapped in a hail drift during a storm in Omaha, Neb., May, 1936.



that no one had presence of mind to weigh it.

"Coming closer to home," the hail authority states, "the stone that fell at Potter, Nebraska, July 6, 1928, deserves all-American honors. In circumference it measured 17 inches and weighed 1½ pounds. In my judgment it was bigger than the whoppers that are said to have fallen in New South Wales almost a century ago and the pick of India's famous storms, none of which ever produced hailstones more than 12 inches in circumference."

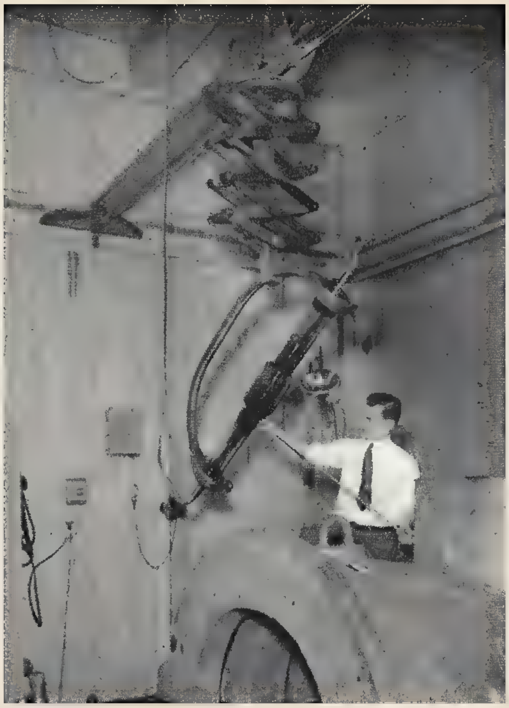
Sworn statements and photographs can be shown in support of the size of the Nebraska hailstone and Flora doesn't have to go any farther than his files to get them.

A peculiar hissing noise served as a prelude to the first hailstones, which were the size of hen's eggs. Larger and larger they grew until they reached grapefruit proportions. Many of these were almost round and their weights ranged from 10 ounces to 1½ pounds. Eye witnesses said these chunks fell about 15 feet

[*Continued on page* 137]

New Outboard Motor Boasts Air-Cooled Cylinders

CLAIMED to be the first and only air-cooled type on the market, a new streamlined outboard motor is equipped with an aircraft magneto which develops 18,000 volts at cranking speed, insuring a start with one pull of the flywheel. An automobile carburetor provides jets for both idling and high speed adjustments. The new engine weighs only 42 pounds and its twin cylinders develop 4½ horsepower. As shown in the photo, cooling of the cylinders is accomplished by fins.



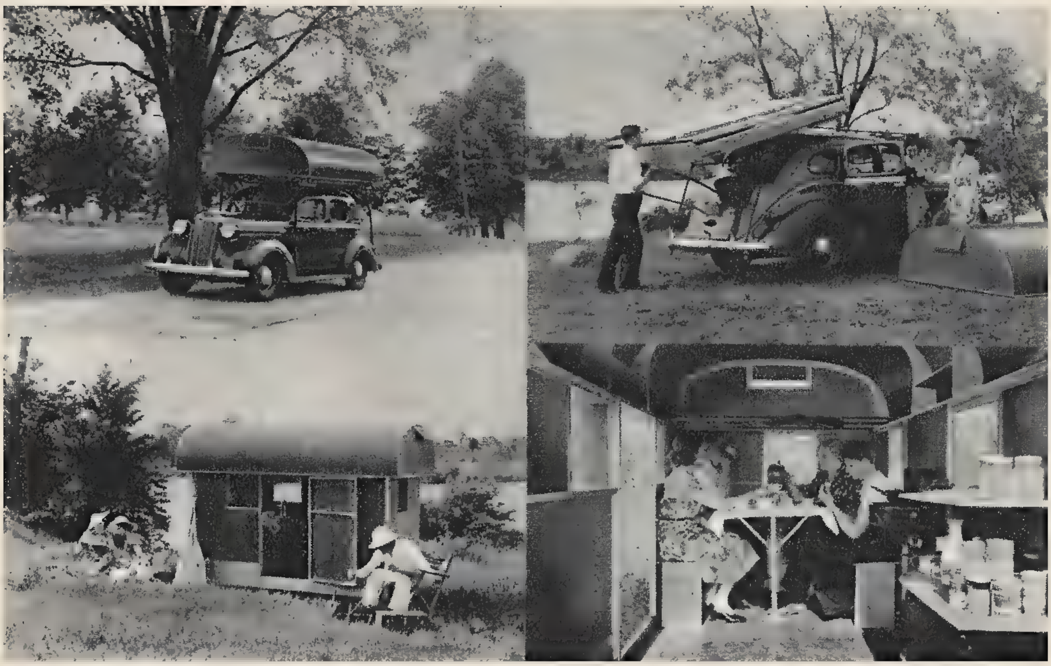
Powerful X-Ray Apparatus Shows Flaws In Castings

CAPABLE of showing the internal make-up of a section of steel which is five inches thick, an X-ray device used in the laboratories of a well known electrical products manufacturer operates on 400,000 volts. In examining heavy steel castings with the X-ray equipment, gas pockets show up on the negative as white "bubbles," while continuous waves represent shrinkage areas. The photo shows the X-ray tube in suspension over a huge turbine casting.

Powers Steam Roller With Auto Engine

NEEDING a heavy roller for a paving job, a resourceful mechanic in Badin, N. C., reclaimed a obsolete steam roller from a junk yard and substituted an automobile motor for its worn-out engine. He mounted the motor atop the old boiler (arrow), connecting its drive shaft to the roller's original gear train.

Collapsible "Home" Carried On Roof Of Automobile



FEATURING six windows fitted with slid-glass and permanent screens, a newly developed prefabricated collapsible house which can be carried on the roof of an ordinary passenger auto enables sportsmen, fishermen and others who like the outdoors to enjoy short or prolonged trips in perfect comfort. In its compact form the folding house measures only 6x9x2 feet. For protection to the car and to facilitate loading and unloading, a metal frame is used to support the house during transit. The frame can be clamped to the car without drilling and is easily removed. The photos above show the house being transported, unloaded, set-up and used by four persons.

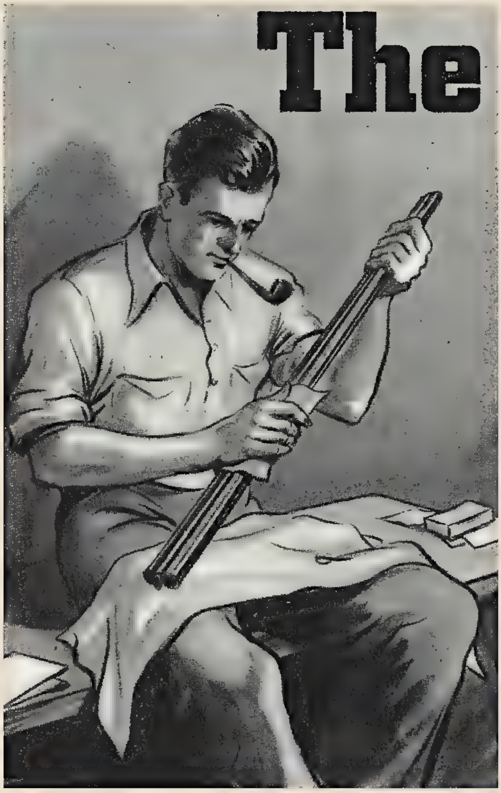
Special Auto Plates Aid Student Drivers

NEW-DRIVER
LEARN RITE
2S 38 82

THE self-consciousness and confusion of student motorists resulting from displays of impatience by other drivers on the road may be greatly eliminated, according to George B. Fisher, of Los Angeles, Calif. When giving driving instructions, he places a plate bearing the words—"New Driver, Please Keep Distance"—above the regular license plate with the result that experienced drivers usually show consideration for the student.

The Amateur

by James V. Howe



The final appearance of the metal parts will depend mainly upon the polishing done before the bluing.

Simplified Bluing Methods

THE essential object of bluing is to dull the bright steel color of the barrel and action or other exposed metal parts of firearms. The process does not entirely prevent the metal from rusting, but steel thus treated is not so readily attacked by rust as if it were left in a bright condition. A well-blued firearm also is more pleasing to the eye. Bluing, in short, is the dressing-up process for the metal parts of a firearm, just as paint is the means of making homes and motor cars more attractive, gas stations more inviting, and the ladies, bless their hearts, more alluring—provided too much is not used. But it will do your gun no good if the essential parts are not thoroughly polished before the bluing solutions are applied. The final appearance of the metal parts depends mainly upon the degree of polish secured before applying the bluing solution.

A wooden holder is a great help in holding the emery cloth while polishing lengthwise on the barrel, this or other parts being held in the vise protected by hardwood, lead, or felt-lined jaws. A wide file is best for draw-filing a rifle or shotgun barrel, as it allows of a straight, well-directed movement of the arms upon the cylindrical surface. It is very efficient in removing the tool marks and other irregular spots often found on a barrel when it has been machined, even with a fine feed on the lathe. It is always well to keep the file chalked on both sides. Every time it is knocked free of chips, the surface should be gone over again with chalk.

Draw-polishing with emery cloth is very similar to draw-filing, except that emery cloth is used in the medium and finer grades to complete the polish of the metal parts before the bluing takes place. By making a holder of hard wood, much better results are obtained and the operation becomes more pleasant. The purpose of draw-polishing with emery and crocus cloth is to eliminate all surface scratches completely. After having once begun to polish, do not lift the polisher from the work, but continue with even strokes the full length of the barrel, particularly when using the finer grades of emery and crocus cloth. Of course, these operations require time and patience, especially on receivers or actions, guards, bolts, triggers, shotgun actions, floor plates, etc. Revolvers, automatic pistols and their actions demand some ingenuity in order to get into their odd forms and corners. This is true also of the interior parts of other weapons that have to be got at before bluing actually takes place.

BLUING—In this chapter the bluing processes described are only two, and these the guncraftsman should use for all his work. (Only one will be described in this transcript. —Editor.) Many other bluing solutions are on the market, but the materials for the formulas here given will be found to be most reasonable in cost. For the price of one small bottle of bluing solution, one can often prepare a whole gallon in his own workshop, by mixing the ingredients himself. Many gunsmiths throughout the country now practise this economical method. Those who wish to experiment on bluing will find a large number of other formulas in "The Modern

Guncraftsman

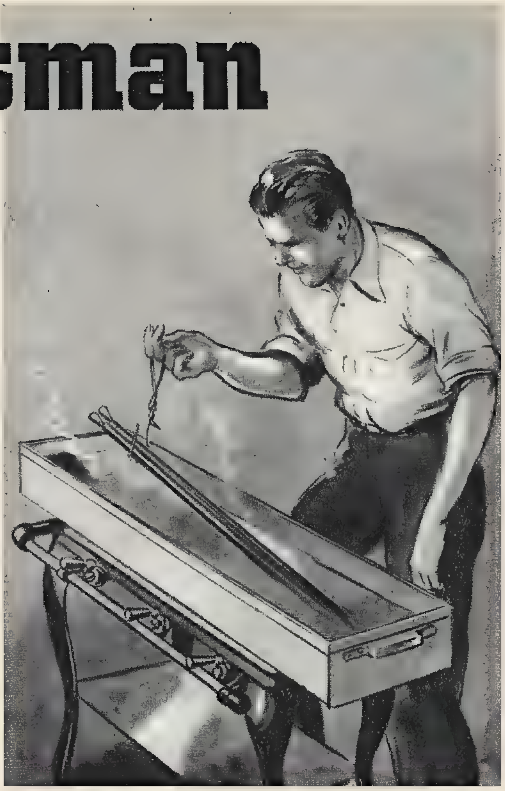
MI's Book-of-the-Month

MI'S "BOOK OF THE MONTH"

Every month several meritorious books are published which the editors believe are of special interest to readers of MECHANIX ILLUSTRATED. We know, of course, that you may not be able to read them all, and for that reason we plan to select the outstanding book of the month and present here an extract from it. The books will be chosen for their special interest in the fields of adventure, travel, sports, science, mechanics and history. The episodes selected will be of some complete dramatic, informative incident.

Readers who wish to obtain these books to be read in their entirety may order them from local book dealers or by mail from the publishers. Every volume from which we will select an extract will form a lasting, worthwhile addition to your library.

"The Amateur Guncraftsman," by James V. Howe, is our selection for November. The publisher is Funk & Wagnalls Co., 354 Fourth Ave., New York, N. Y. Price is $4.00.



The bluing solution is heated in a galvanized tank of a length that will accommodate the longest gun barrel.

Gunsmith." (Also available from the publishers of "The Amateur Guncraftsman.)

Gunsmiths have for hundreds of years racked their brains and consumed buckets of midnight oil trying to devise some method whereby the metal parts of a firearm could be blued merely by immersing the parts in a tank of prepared solution, without much physical labor. I do not wish to conceal the sum total of sublime patience that is usually needed in polishing metal gun parts, but with the No. 1 formula given here some remarkable things can be done. An old rifle or shotgun with the original finish or bluing badly worn can be rebaptized in a tank of this solution, and in ten minutes after it begins to boil, its outer surface should be free of any signs of sinful use.

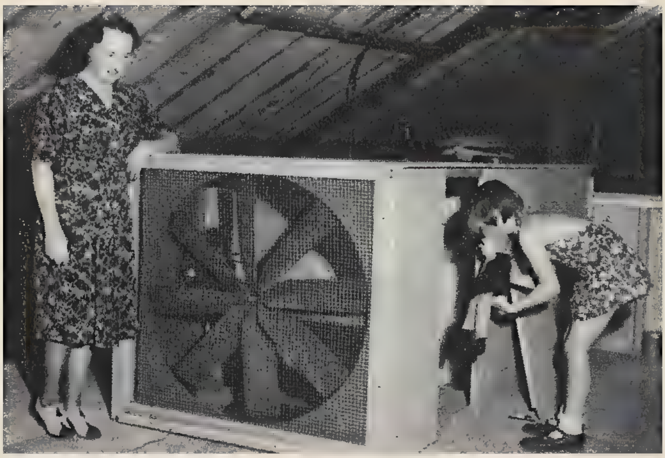
Both of the formulas given in this chapter require the following preparations. After the barrel or other metal parts of a firearm have been polished, a plug of maple must be made and inserted into the muzzle and another into the chamber end of the barrel to keep the solutions from entering the bore.

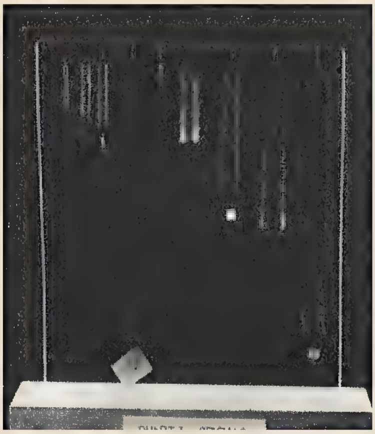
If you intend using only the No. 1 formula in the workshop, one tank is all that is necessary, for this formula does not really require any caustic or lye to remove the grease from the metal parts. The bluing problem is here made very simple, and we are of the opinion that No. 1 formula will be the standard for nearly all guncraftsmen using this book.

The galvanized tank should be made five inches wide and five inches high, the length being governed by the longest barrel or part which is to be blued—42 to 44 inches is very convenient. Each end of the tank should have a good-sized handle for removing it from the gas stove and for convenience in cleaning.

The No. 1 formula is very easy to prepare. Any guncraftsman can order the chemicals from any wholesale drug company, or from the local druggist, though the latter should not be allowed to charge for them at prescription rates. This bluing formula has now become the standard for the home workshop. It assures a finished job of the best quality, imparting a rich, lustrous, deep blue-black that reminds one of dark satin. The actual bluing of the parts requires only ten minutes to complete after the solution begins to boil; thus the mixture remains after the parts are removed and can be used over and over again on other weapons.

[*Continued on page* 143]





Baby Chair Folds Flat

MOUNTED on wheels and featuring an adjustable seat and reclining back, which can be placed in several comfortable positions, a newly developed baby chair can be folded and carried like a hand bag. A detachable receptacle for toys is also featured.

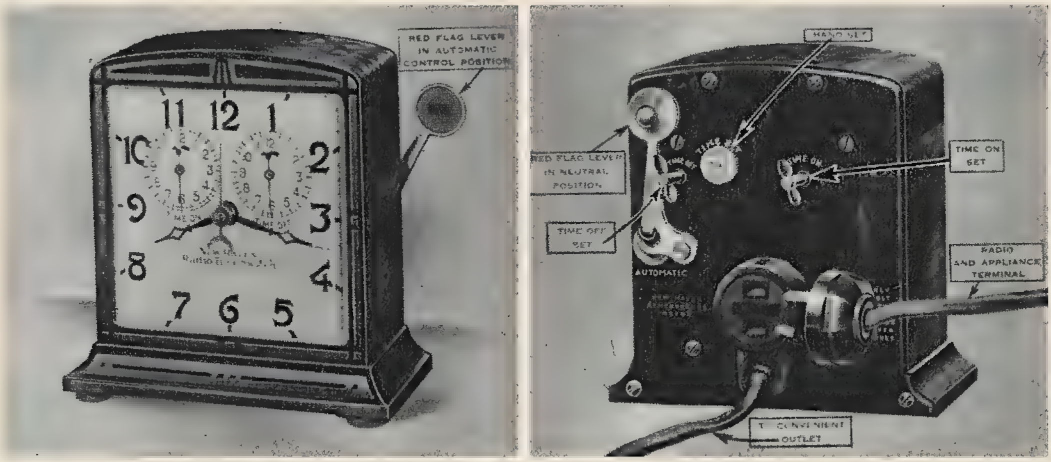
Attic Unit Cools Home

EASILY installed in the attic of a home, a new electrically driven fan-type ventilating unit is said to provide an effective means of exhausting hot, stagnant air from all rooms in the home while drawing in cool, refreshing air.

Test Quartz Springs

MORE suitable than steel springs because they can be stretched to ten times their normal length without impairing their springiness, hair-like quartz filaments are being tested as springs in certain types of laboratory apparatus.

Clock Device Times Electrical Appliance Operation


RED FLAG LEVER IN AUTOMATIC CONTROL POSITION
HAND SET
RED FLAG LEVER IN NEUTRAL POSITION
TIME ON SET
TIME OFF SET
RADIO AND APPLIANCE TERMINAL
TO CONVENIENT OUTLET

A NEW electric clock device can be set to operate a radio, percolator or any other electrical appliance from a minimum of ten minutes to a maximum of five hours. The appliance to be operated is plugged into the clock and a time-set hand adjusted as desired. A red "flag" lever flashes while the appliance is in operation.

Door Lock Features Alarm

AUTOMATICALLY set when the door is locked, a self-contained lock for the home sounds an alarm whenever an attempt is made to jimmy the door. The alarm does not interfere with normal use of the door.

Auto Aerial Is Adjustable

OPERATED by the vacuum system of an auto, a new adjustable radio aerial is instantly moved up or down by pressing a button on the dashboard. When lowered, the aerial becomes inconspicuous (inset photo).

MI Readers'

THE MI Readers' Service Bureau was started for the express purpose of making MECHANIX ILLUSTRATED a more valuable magazine for its readers. The editors have felt that too many readers overlook the value of the advertising columns and hence miss many valuable opportunities. After all, advertisers spend thousands of dollars every month on interesting booklets and other literature.

MECHANIX ILLUSTRATED censors its advertising stringently for your protection and therefore urges you with full confidence to take advantage of its columns and the many attractive offers made in them.

To bring them to your attention and to simplify your obtaining information from the advertisers you select, all the offers made in this issue, with the exception of those in the classified section. are listed on this and the opposite page.

WARNING!

Don't fail to examine all advertisements in this issue and the offer they make. We are willing to forward three of your requests for booklets, etc., but don't let this stop you from ordering additional material directly from other advertisers. REMEMBER—read the advertisements *carefully*.

It is the function of the Readers' Service Bureau to act as a clearing house for both readers and advertisers. The listing gives offers made, the cost of each, and a convenient identifying number. To simplify the ordering of booklets, samples, catalogs, etc., the bureau will forward your requests to three or less of the firms listed.

Merely write your name and address on the coupon, mark the numbers of the offers wanted, and mail the coupon either in an envelope or attached to a post card. The Readers' Service Bureau will do the rest.

If the offer selected is listed as "free," all you have to do is to send in the correctly marked coupon. If there is a slight charge (usually only 3 cents and rarely more than 10 cents to cover the cost of mailing bulky catalogs, booklets or samples), be sure to include correct amount with the coupon, U. S. Postage stamps are acceptable.

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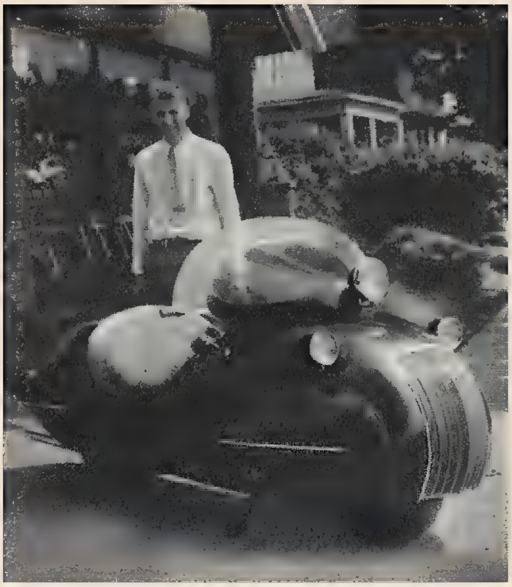
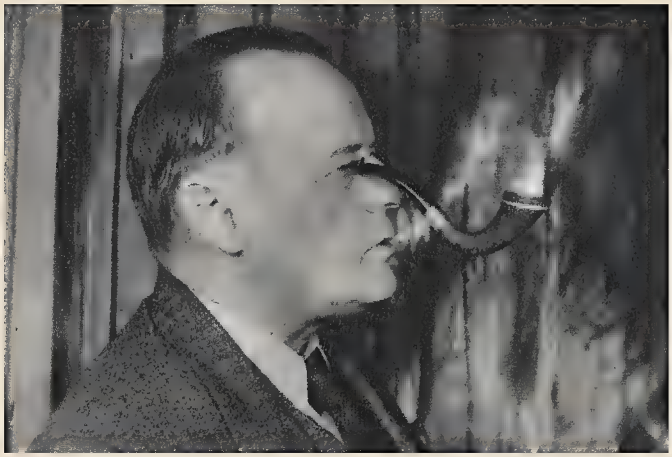
Constructs Novel Motorcycle



POWERED by a four-cylinder motor, a motorcycle constructed by Raymond Courtney, of Lansing, Mich., features a specially designed, streamlined sheet-metal body which is said to increase road speed about 20 m.p.h. Sections of the body are easily removed, facilitating repairs or adjustments. The novel motorcycle is equipped with hydraulic brakes, both front and rear, and the unusually small wheels are fitted with airplane tires, providing the machine with an extremely low center of gravity. The wheel turrets are so constructed that one is used as a gasoline tank while the other three are used to carry small luggage.

Foam Gun Cleans Upholstery

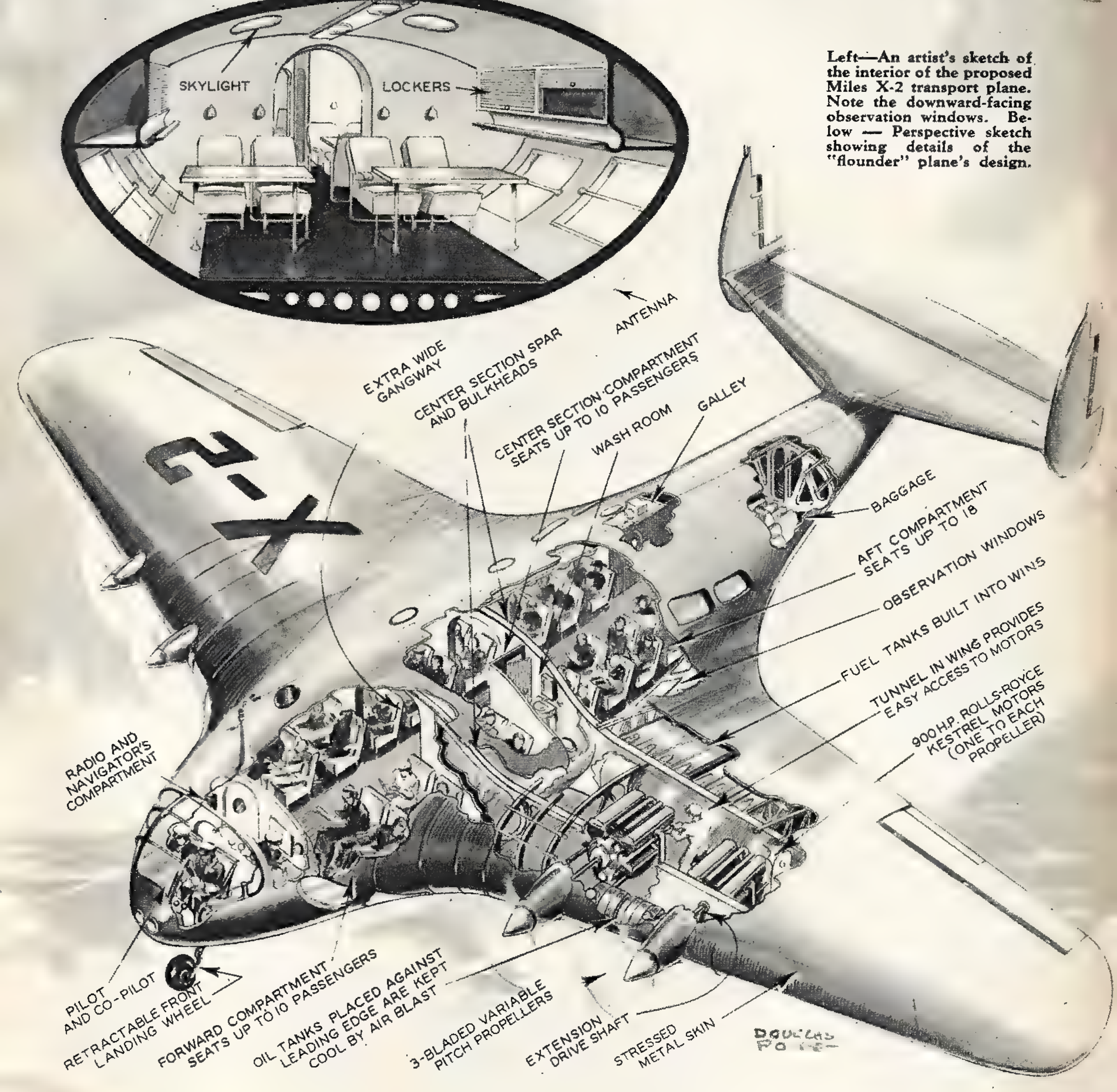
OPERATED by air pressure, a newly developed upholstery-cleaning "gun" for automotive use produces a lathery foam which is said to rapidly and thoroughly remove dirt, grease and grime. The device contains an agitator which breaks liquid soap into bubbles which are then compressed into a very fine foam by forcing them through a series of fine-mesh screens. The foam is squirted on the upholstery and allowed to set a few minutes after which it is wiped off with a clean dry rag.



Smokes Pipe Through Tear Duct Of Eye

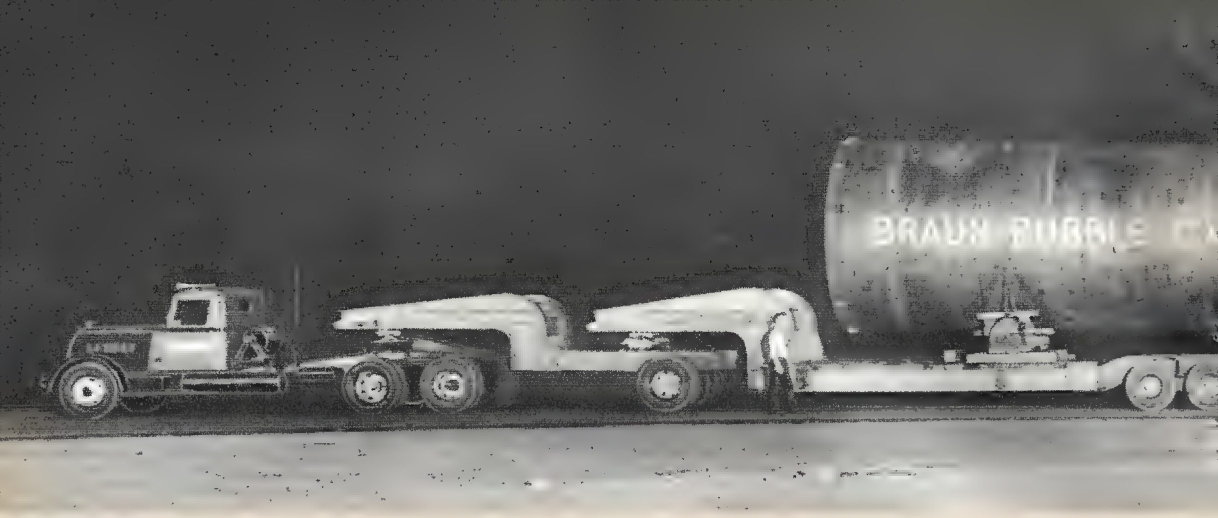
ALFRED LANGEVIN, 57-year-old French-Canadian, can smoke through his eye. The pipe is held in position before the corner of his eye by means of a nose clip and he inhales through the eye. Exhaling is done through the mouth. The smoke actually passes through the right eye's tear duct, which does not store secretion intended by nature.

New "Flounder" Plane Is Britain's Bid For Airline Supremacy


SKYLIGHT
LOCKERS
ANTENNA
EXTRA WIDE GANGWAY
CENTER SECTION SPAR AND BULKHEADS
CENTER SECTION COMPARTMENT SEATS UP TO 10 PASSENGERS
WASH ROOM
GALLEY
BAGGAGE
AFT COMPARTMENT SEATS UP TO 18
OBSERVATION WINDOWS
FUEL TANKS BUILT INTO WINS
TUNNEL IN WING PROVIDES EASY ACCESS TO MOTORS
900 H.P. ROLLS-ROYCE KESTREL MOTORS (ONE TO EACH PROPELLER)
X-2
RADIO AND NAVIGATOR'S COMPARTMENT
PILOT AND CO-PILOT
RETRACTABLE FRONT LANDING WHEEL
FORWARD COMPARTMENT SEATS UP TO 10 PASSENGERS
OIL TANKS PLACED AGAINST LEADING EDGE ARE KEPT COOL BY AIR BLAST
3-BLADED VARIABLE PITCH PROPELLERS
EXTENSION DRIVE SHAFT
STRESSED METAL SKIN
DOUGLAS ROLFE

Left—An artist's sketch of the interior of the proposed Miles X-2 transport plane. Note the downward-facing observation windows. Below — Perspective sketch showing details of the "flounder" plane's design.

A DESIGN for a super airplane, which would constitute a national bid for world-wide airline supremacy, has been projected by Fred Miles, prominent British aeronautical engineer. As shown in the sketches, the proposed 38-passenger plane resembles a flounder in general appearance. The estimated performance figures for the plane when powered by four 900 horsepower motors indicate a top speed of 295 m.p.h.



Mammoth Highway Trailer Carries 140-Ton Loads

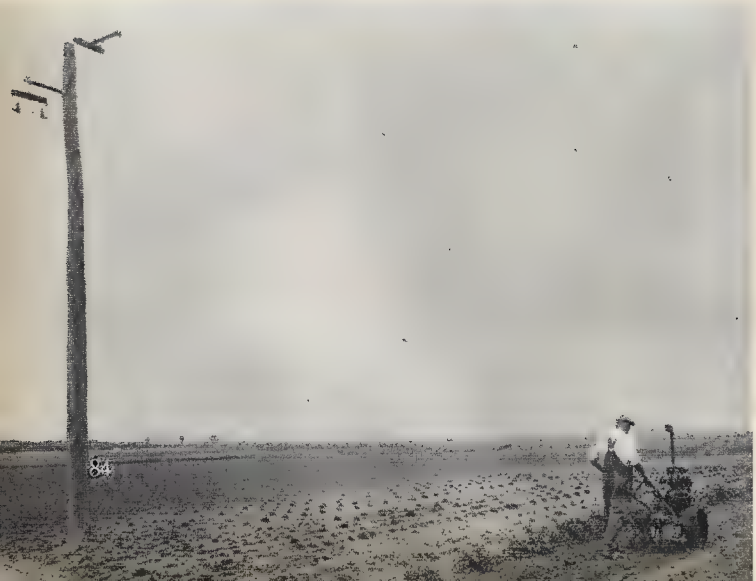
PULLED by a tractor truck powered by a 200 horsepower diesel motor, a mammoth highway trailer developed by a California firm is equipped with 34 wheels and has carried loads of 140 tons. Longer than a Pullman car, the trailer is so wide that its chassis takes up a large share of the

Device Counts Dust

DIRECT counting of dust concentration without any intermediate laboratory work with a microscope is possible through use of an inexpensive instrument recently developed. Simple in operation, the device can be used satisfactorily by an inexperienced layman.

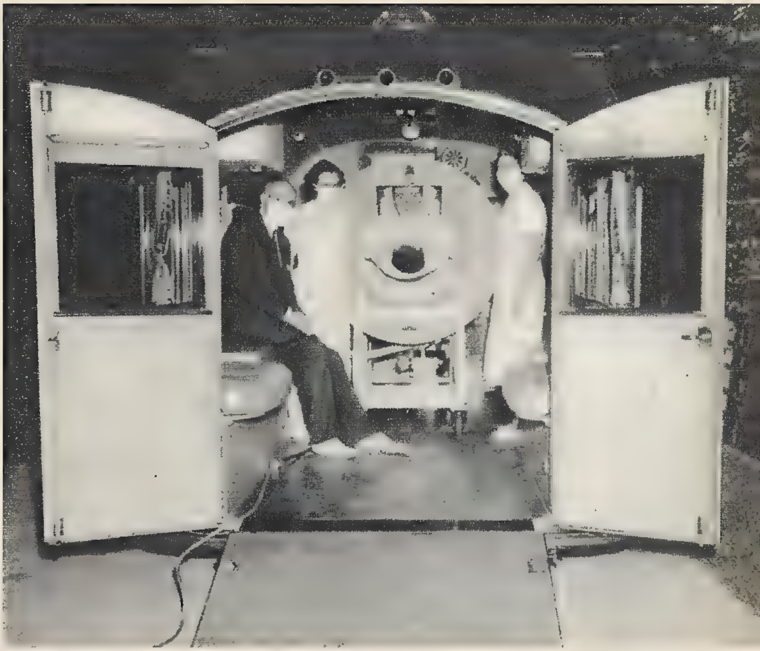
Farm Cultivator Runs Like Trolley Car

DERIVING its current supply from parallel power lines, 2,000 feet long and strung on poles down the center of his farm, a novel electrically-driven cultivator has been devised by H. W. Collins, of Mt. Clemens, Mich. A trolley, from which a rubber-coated extension cable leads to the cultivator, runs along the power line wires, as shown in photo.



road and a special permit covering a specified route must be obtained before it can be operated on the highway. Despite its huge size, the trailer is said to handle well at speeds ranging from five to fifty miles per hour. The photo above, running across both pages, shows the trailer hauling a 91-foot tower weighing 105 tons.

"Iron Lung" Patient Travels In Trailer



ACCOMMODATING the "iron lung" in which he has been confined since an infantile paralysis attack two years ago, a special trailer built for Fred Snite, Jr., of Chicago, Ill., features angular roof mirrors which enable him to see the countryside en route.

Weatherproof House Siding Developed

MADE of asbestos and special white cement, a newly developed fireproof house siding needs no painting and has a surface grain that gives it the appearance and beauty of old weather-worn clapboards. The siding is supplied in convenient eight-foot lengths which are $\frac{3}{16}$-inch thick and 9½ inches wide and is said to retain its color forever.

HANDY STAMP CABINET

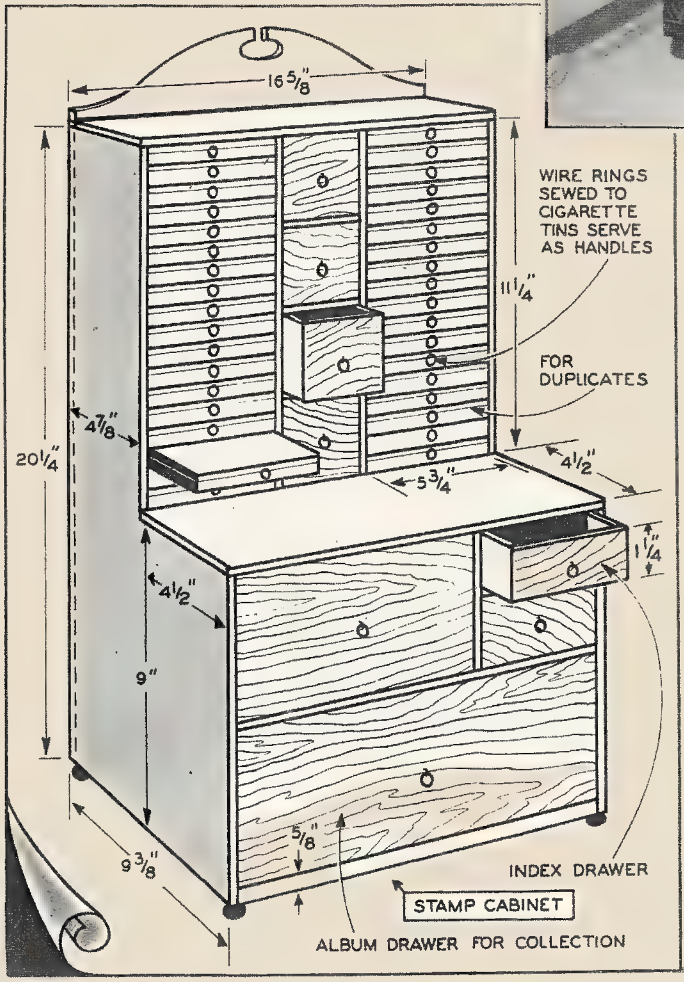
by Carl F. Laubach

A HANDY cabinet for the stamp collector can be made by utilizing empty flat-fifty cigarette tins, old cigar boxes and scraps of plywood. In the cabinet pictured below, thirty-six tins were used. Each has a small wire ring sewed with stout thread to the lid through two small holes punched for this purpose. The rings serve as handles in removing the tins. On the front of each box, the name of a country, can be scratched in the original paint, making a permanent place for duplicate stamps of that country.

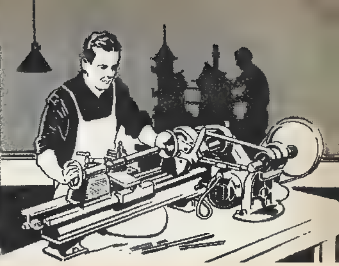
Between the two stacks of cigarette-tin drawers are four cigar box drawers with plywood panel fronts. The same size rings fastened with small staples to the wood serve as knobs. The drawers can be used for special stamps, hinges, etc. In this particular cabinet, one drawer was made with shallow sides to be used as a file. Inside is an alphabetical index and cards cut to fit the file on which are kept the names and addresses of fellow collectors and dealers.

The lower part of this handy cabinet is made to suit the size of the collector's albums. The bottom drawer is large enough to accommodate his albums and perhaps a catalogue or magazine. The two drawers above are long and wide enough so that one can be used for pencils, stamp tweezers, magnifying glass, etc., and the other for mail concerning stamps.

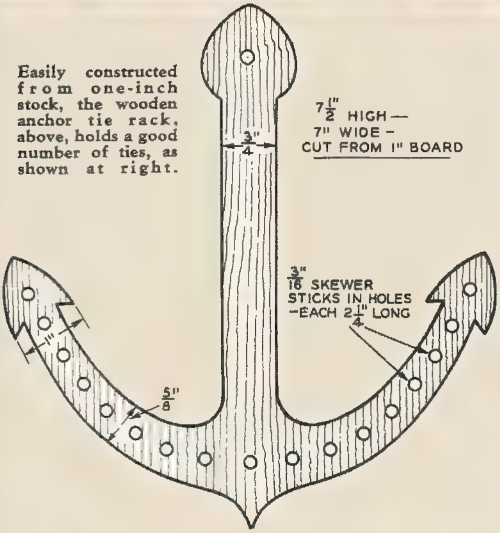
The compartment at the left is merely a fancy, locking cigar box which contains a series of envelopes standing upright to be used for filing. Behind this is another cigar box, for miscellaneous objects.



CRAFTS AND HOBBIES



Easily constructed from one-inch stock, the wooden anchor tie rack, above, holds a good number of ties, as shown at right.



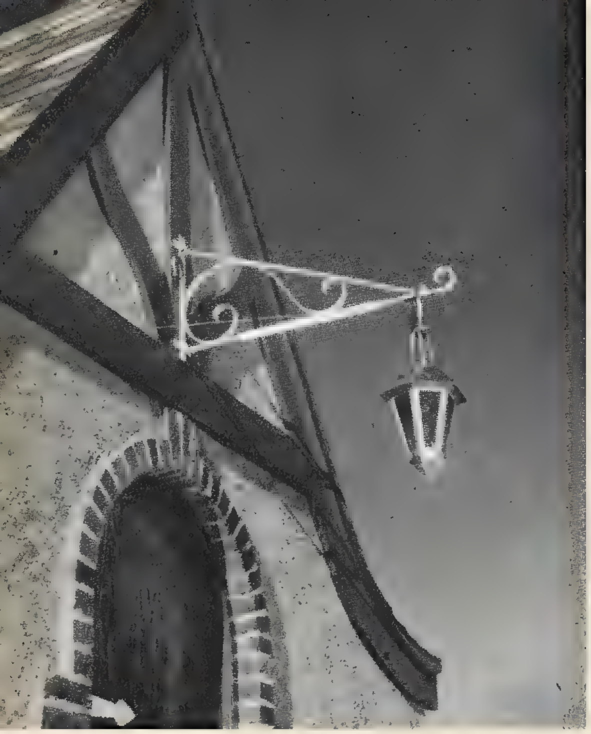
AN ANCHOR TIE RACK

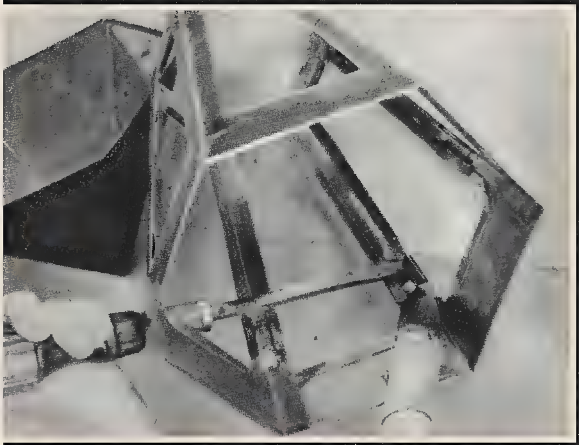
THIS distinctive anchor tie rack is cut from any wood with a hand coping saw or a small jig saw run with a small electric motor. The pegs are cut from skewer sticks such as are used in meat markets. They are $\frac{3}{16}$-inch in diameter, polished and true and are made from clear white maple.

The anchor is 7 inches across and 7½ inches high. An excellent way to make the pattern is to fold a sheet of paper and lay out half of the design. After half the pattern is drawn, hold the paper still folded and cut both sheets of paper along the pencil lines. When opened, you have a balanced paper pattern. This is now glued to the board to be used. Walnut is ideal, red gum is nearly as good, and stained white pine is satisfactory. Saw out carefully around the paper pattern, then sand each edge to remove saw teeth marks.

Bore $\frac{3}{16}$-inch holes nearly through the anchor, evenly spaced and all on a curved

[*Continued on page* 136]





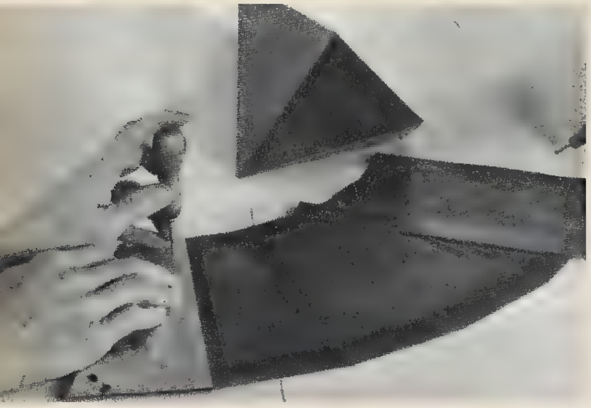
COPPER

by Reginald O. Lissaman

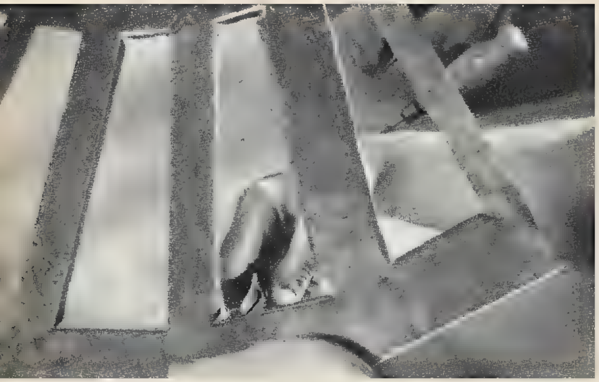
THIS attractive lantern will lend a welcoming charm to any entrance, and while suggestive of the old world it was not however reproduced from any particular antique. Instead the design was worked out in paper until a pleasing shape was achieved, consistent with economy of material and simplicity of construction. Made entirely of copper, there is nothing to rust or otherwise deteriorate with time, and as may be seen from the illustration, the lamp is well worth making from a decorative viewpoint alone.

The body of the lantern should be laid out first. A template is made, from the scale drawing, of a single lamp face; from this sheet-metal template a layout of the six sides are drawn on paper. Lay the template on the paper and trace the outline ABDC. Then move the template over till AB of the template falls along and coincides with the line CD just drawn. Repeat this until all six faces are shown, plus a quarter of an inch on one side for the lap joint. This paper pattern is now laid on the sheet copper in such a manner as to cut with the least waste. The pattern is used for this purpose only. The actual layout onto the copper is done with the template, for accuracy. The window openings may at this time be located by prick-punching at the correct points.

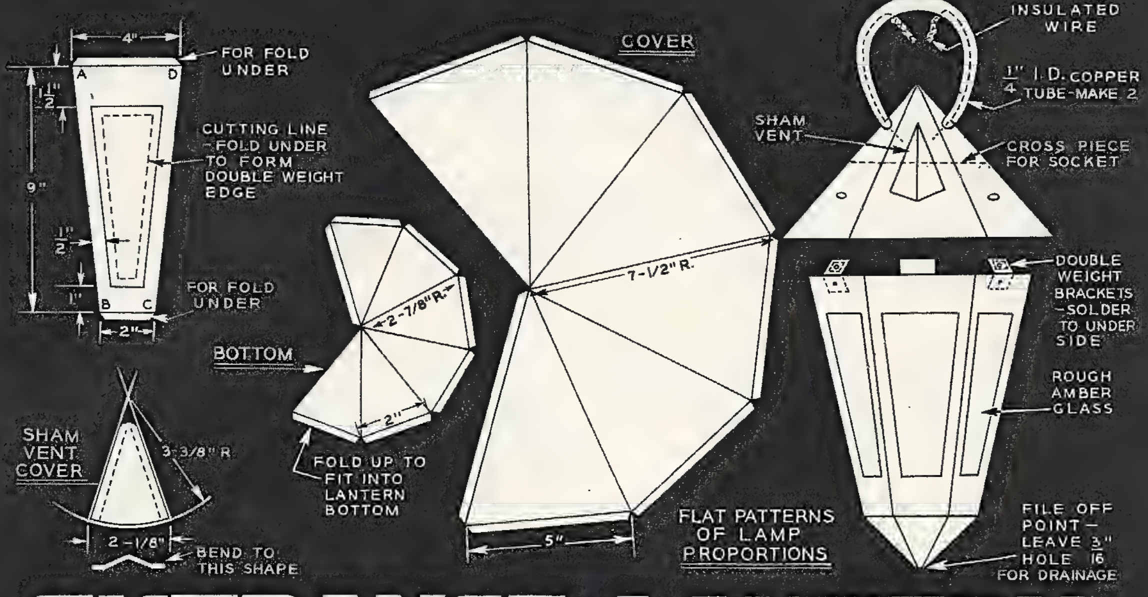
The glass openings are cut out with a wood chisel, with the copper being held over the end



A template is used for locating the corners of the cut-out portion of the faces. Any sharp pointed instrument can be used to mark the corners. This work should be done very carefully.



Openings for the glass are cut smaller than the finished size; the edges are turned in as shown in the photograph. Later they are beaten down flat to form a double weight edge.


4"
FOR FOLD UNDER
A
D
1 1/2"
CUTTING LINE —FOLD UNDER TO FORM DOUBLE WEIGHT EDGE
9"
1/2"
1"
B
C
FOR FOLD UNDER
2"
COVER
7-1/2" R.
BOTTOM
2-7/8" R.
2"
FOLD UP TO FIT INTO LANTERN BOTTOM
5"
SHAM VENT COVER
3-3/8" R
2-1/8"
BEND TO THIS SHAPE
FLAT PATTERNS OF LAMP PROPORTIONS
INSULATED WIRE
1/4" I.D. COPPER TUBE-MAKE 2
SHAM VENT
CROSS PIECE FOR SOCKET
DOUBLE WEIGHT BRACKETS —SOLDER TO UNDER SIDE
ROUGH AMBER GLASS
FILE OFF POINT — LEAVE 3/16" HOLE FOR DRAINAGE

ENTRANCE LANTERN

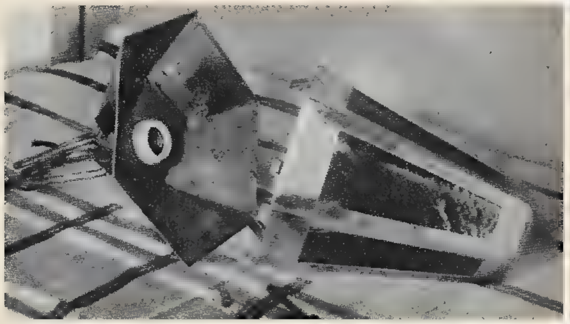
grain of a block of wood. The openings are cut smaller than finished size, so that the material can be folded back to form a heavier edge. Forming the balance of the body, top and bottom will offer little difficulty, since copper is an easy material to work with. Be sure, however, to save all cutting scraps for forming the sham vent covers, glass clips, and socket support, etc.

The handle, or rather the hanging rings, are formed from fairly heavy ¼" inside diameter copper tubing, through which passes the insulated wiring. These rings are fixed to the top by passing their ends through holes in the top, flaring the tube end and then soldering. Keep all soldering inside, where it will not show. This is done by sweat soldering all lap seams. Steel wool will clean the desired portions, which are then tinned, and while held in place sweated together. A healthy sized soldering tool will be found necessary, since the sheet copper will conduct the heat away from a small tool before it has done its work.

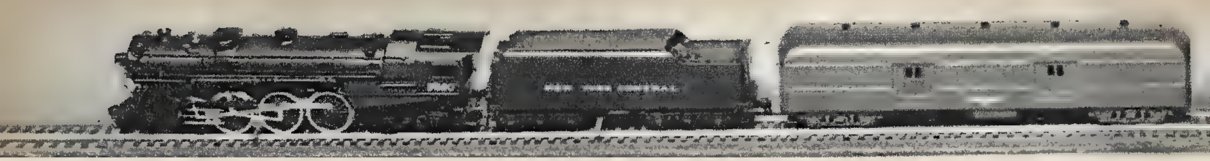
Three clips are soldered in place for each piece of glass. The angles which connect the body to the top are formed from two-ply of the sheet copper; riveted and soldered to the body, with nuts soldered to the angles for attaching to the top. The cross piece holding the porcelain socket is fixed in the top after all other work on this part is completed, as it will be next to impossible to wire it afterward.

[*Continued on page* 134]

The bottom piece is fitted into the body as shown by the photograph. They are fixed solidly into position by sweat soldering. A tiny hole is left in the end for drainage.



The finished lantern ready for the bulb to be inserted before final assembling. The wiring enters through the rings at top.



Three "00" Gauge

THESE cars were built to go with "Midget Mike," the locomotive described in the March, April and May, 1937 issues of MODERN MECHANIX.

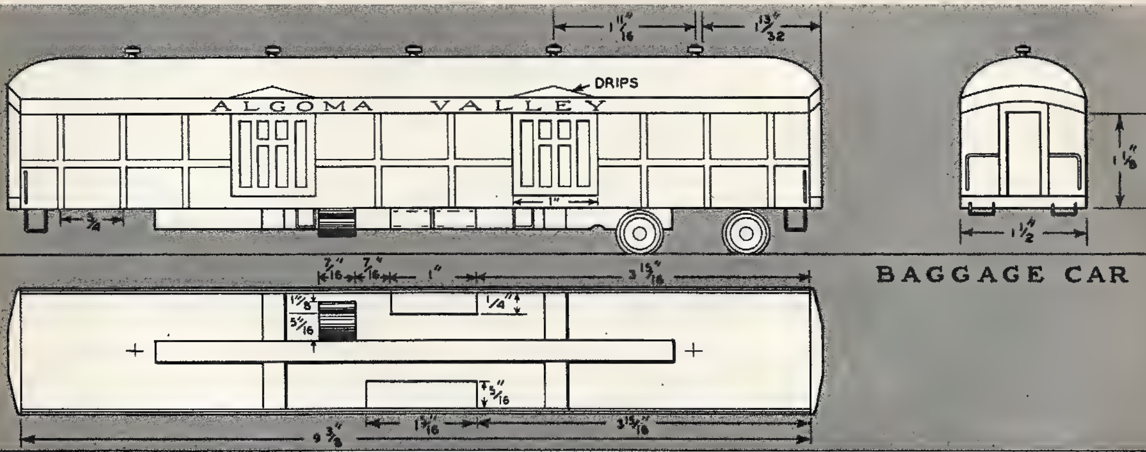
They are models of the shorter type of cars, designed so that they can take short radius curves. The Pullman car shown is of the eight-section type which is shorter than the standard twelve-section car.

The construction of this car is the same as that of practically every type of passenger car model. Be sure to study the plans carefully and make a mental note of all the details of the sides, roof and underbody. It will be noticed that there are two entirely different sides on the Pullman and the different pieces of underbody equipment match individual sides. The two sides of both the coach and the baggage car are the same. However, be sure to locate the underbody details properly.

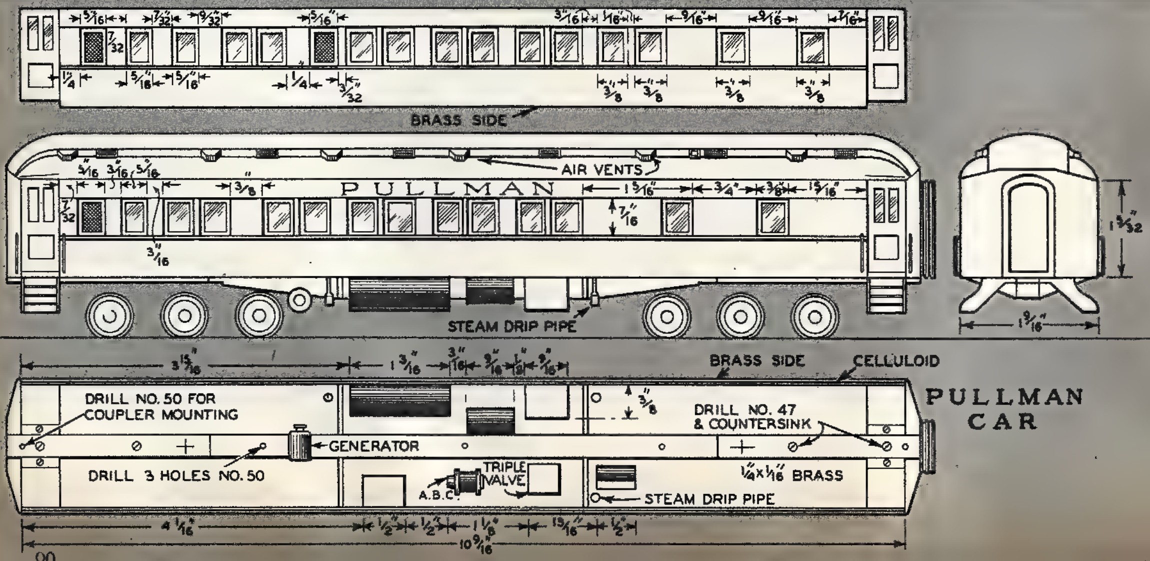
When filing, sawing or sanding any parts, it is much better to take off too little than too much, because more can always be taken off, but it is difficult to replace.

When you are cutting out the parts for the cars, it is easy to cut a number of them and build several cars at once.

Before we proceed with the construction of


DRIPS
ALGOMA VALLEY
1 1/16"
1 13/32"
3/4
1"
1 1/8"
1 1/2"
7/16"
1"
3 13/16"
1 1/8"
5/16
1/4"
5/16"
9 3/8"
1 3/16"
3 13/16"

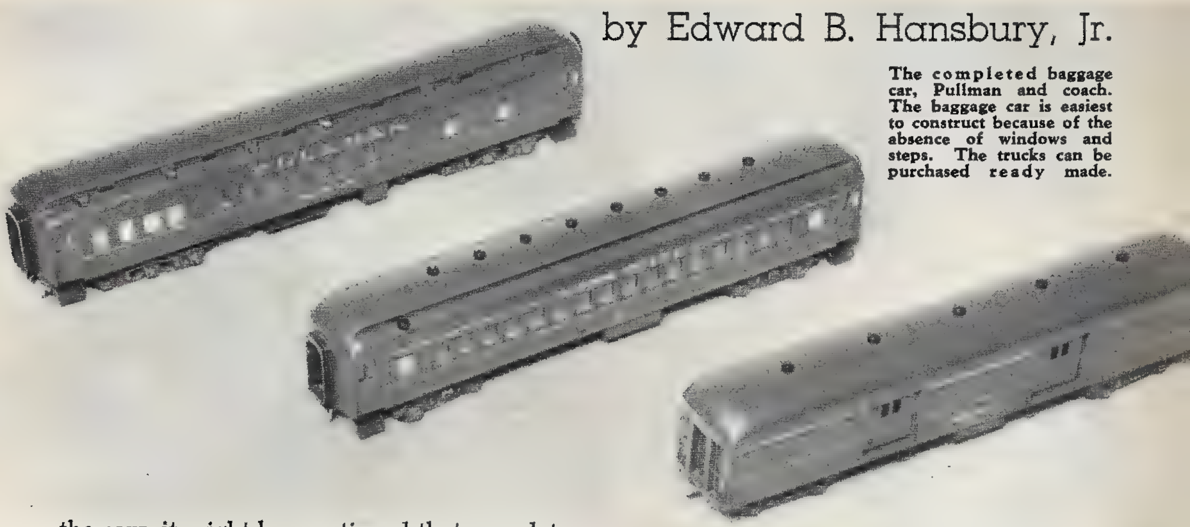
BAGGAGE CAR


BRASS SIDE
AIR VENTS
PULLMAN
STEAM DRIP PIPE
1 9/32"
1 9/16"
3 13/16"
BRASS SIDE
CELLULOID
DRILL NO. 50 FOR COUPLER MOUNTING
GENERATOR
DRILL 3 HOLES NO. 50
TRIPLE VALVE
A.B.C.
DRILL NO. 47 & COUNTERSINK
1/4"x1/16" BRASS
STEAM DRIP PIPE
4 1/16"
10 9/16"

PULLMAN CAR

Model R. R. Cars

by Edward B. Hansbury, Jr.



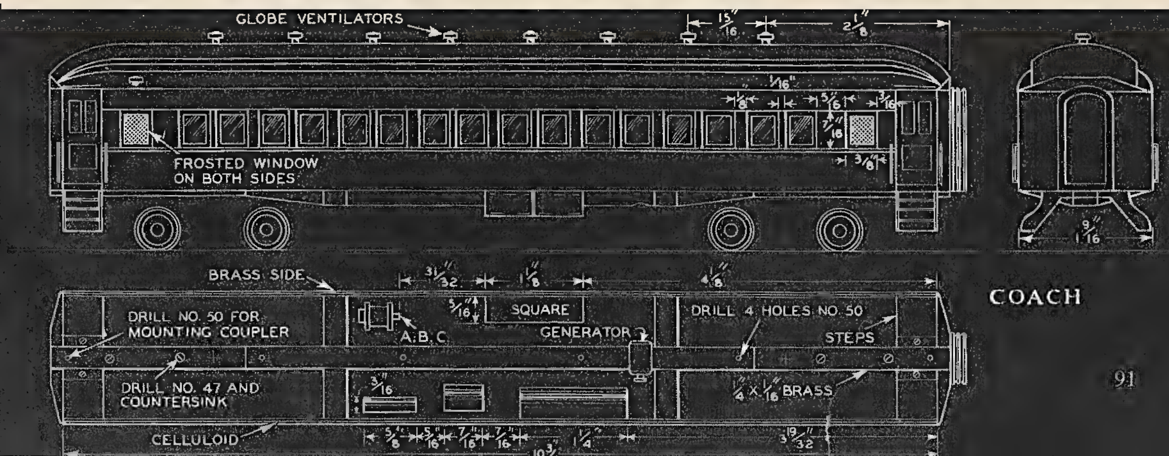
The completed baggage car, Pullman and coach. The baggage car is easiest to construct because of the absence of windows and steps. The trucks can be purchased ready made.

the cars, it might be mentioned that complete kits for these cars can be obtained from your favorite model dealer. In these kits, the sides are stamped brass with the window sashes, letterboard and beltrail formed. The ends are aluminum castings, while the generator, air brake cylinder and steam drips are turned brass. The triple valve, steps, couplers and vents are bronze castings.

The brass slides of these kits can be shortened by carefully sawing four windows from the center and soldering the ends together.

However, we will proceed by describing how to build the cars from raw materials. The foundation for all the cars is the floor. Secure a piece of straight-grained pine 1⅜″ wide and ¼″ thick. The Pullman floor is $10\frac{9}{16}''$ long. On the underside of the floor, pencil in the outlines of the various details such as air tanks, battery boxes, etc. This will eliminate errors when you finally fasten the parts in place. The roof is a length of standard Pullman roofing, obtained from your dealer. Cut a setback on each end so that the underside section of the roof will be exactly the same length as the floor. The ends can be cast aluminum or a piece of pine shaped as per plans. Nail the floor, roof and ends together.

[*Continued on page* 134]


GLOBE VENTILATORS
15/16
2 1/8″
1/16″
1/8″
5/16
3/16
7/16″
3/8″
FROSTED WINDOW ON BOTH SIDES
5/32
1 9/16″
BRASS SIDE
31/32″
1 1/8″
4 1/8″
5/16″
SQUARE
DRILL NO. 50 FOR MOUNTING COUPLER
A.B.C.
GENERATOR
DRILL 4 HOLES NO. 50
STEPS
DRILL NO. 47 AND COUNTERSINK
3/16″
1/4 X 1/16 BRASS
CELLULOID
5/8″
5/16″
7/16″
7/16″
1 1/4″
3 19/32″
10 3/

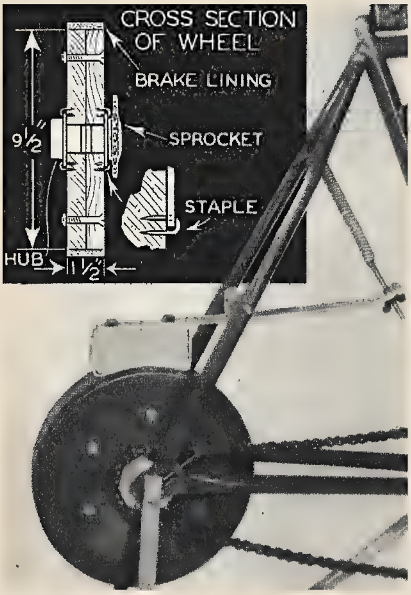
COACH

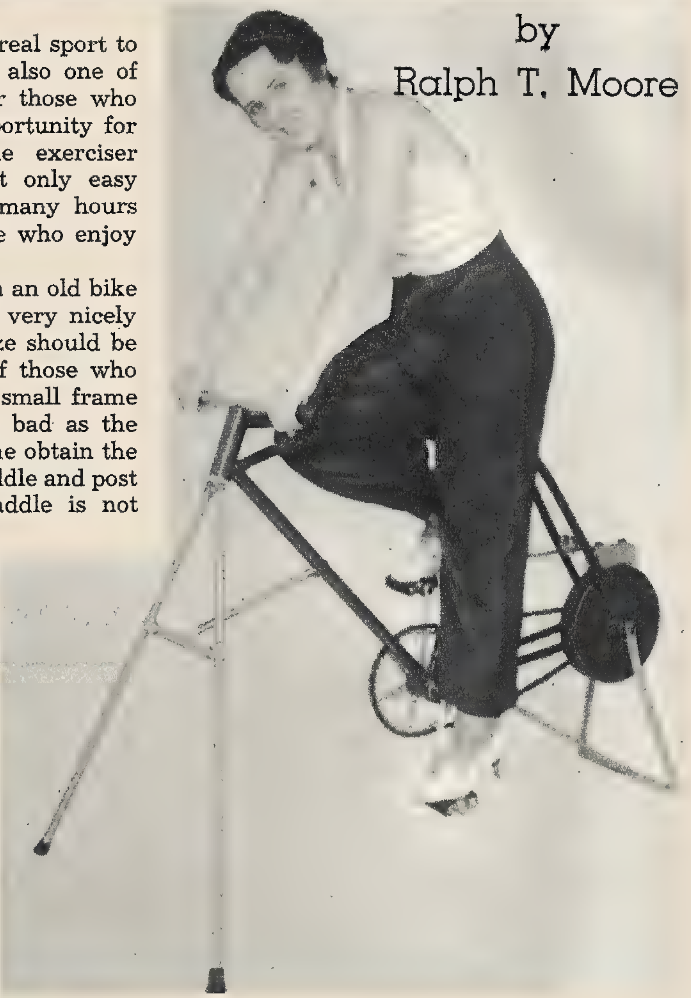
Indoor Bicycle Exerciser

by Ralph T. Moore

RIDING a bicycle is not only real sport to both young and old but is also one of the best forms of exercise. For those who do not have the time or the opportunity for the real thing, this homemade exerciser is a good substitute. It is not only easy to construct but it will afford many hours of profitable enjoyment for those who enjoy bicycle riding.

To start the construction obtain an old bike frame. Almost any one will do very nicely but some choice of the frame size should be kept in mind in consideration of those who may use the exerciser. Thus a small frame for a large person would be as bad as the reverse condition. With the frame obtain the crank assembly, pedals, chain, saddle and post and a rigid rear hub. The saddle is not necessary but the rear hub must be a rigid one and NOT a coaster brake type. Having obtained these parts clean them with gasoline, check the bearings and grease the crank bearings.

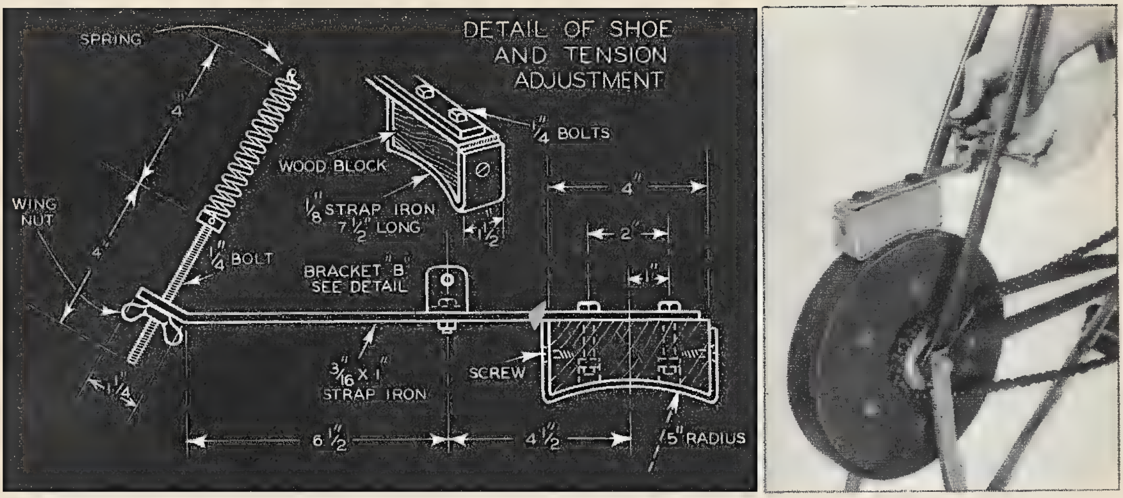




Above is shown the completed bicycle exerciser in use. The machine is easily and inexpensively constructed and furnishes an excellent form of exercise. At left is shown details of the friction disc assembly.

From a piece of ¾" hardwood saw out two 9½" diameter circles, then bolt or screw these together with the grain running opposite and if possible true the assembly up on a lathe. Now obtain about 31" of 1½" wide brake lining and using small finishing nails, nail this around the disc assembly. Locate the nails about 1" apart taking care to avoid causing bumps. Cut the end to form a smooth joint. Countersink all nails.

Now dismantle the rigid hub and measure the distance inside the spoke flanges. Then with a hacksaw, saw out a section at the center to make the flanges 1⅜" apart. Drill a hole through the exact center of the wood discs the size of the hub and insert the hub halves on each side of the disc. Drive these in place and then secure them with double-pointed tacks driven into every other spoke hole. Reassemble the hub and grease the


DETAIL OF SHOE AND TENSION ADJUSTMENT
SPRING
4″
WING NUT
4″
1¼″
¼″ BOLT
WOOD BLOCK
⅛″ STRAP IRON 7½″ LONG
¼″ BOLTS
1½″
BRACKET "B" SEE DETAIL
$\frac{3}{16}$″ X 1″ STRAP IRON
SCREW
4″
2″
1″
6½″
4½″
5″ RADIUS

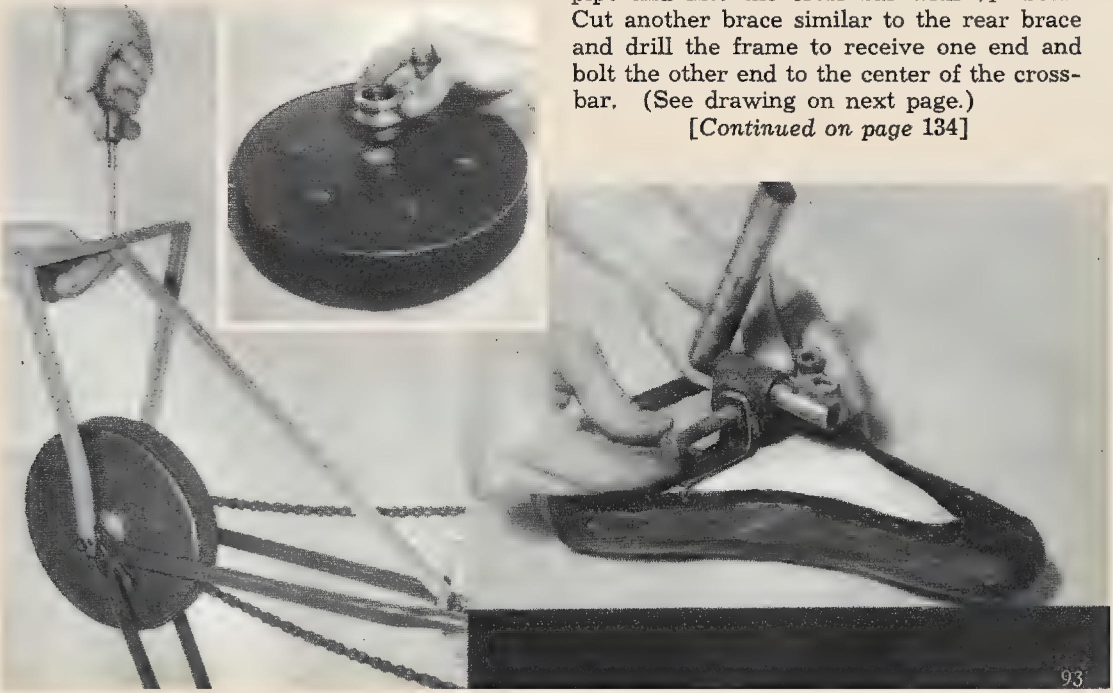
The pressure of the shoe against the disc regulates the amount of work necessary for pedaling up imaginary hills. A strip of ⅛-inch strap iron is fastened over the surface of the shoe to prevent wear as it rubs against the friction disc.

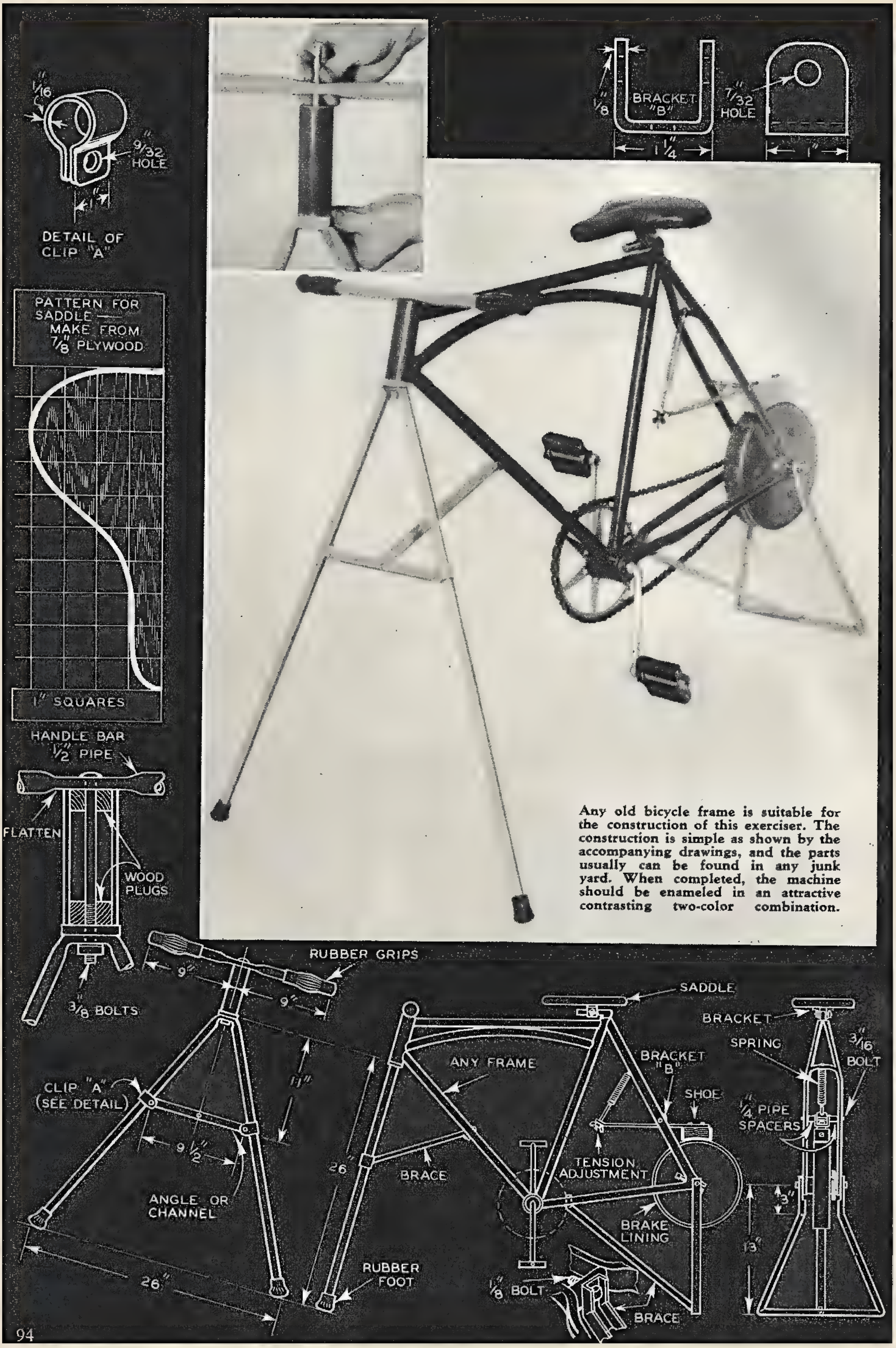
bearings, then mount it in place as you would a regular wheel.

The next step is the rear stand. This is made from either ¾″ channel iron or angle stock of similar size. The channel makes a neater job and is therefore recommended. A piece 3′ 4″ long is necessary for the stand and is bent as shown in the drawing. The flanges of either the channel or angle are notched with a hacksaw for the two abrupt bends at the bottom. Saw off the flanges at the ends and drill to fit over the rear axle. Drill a $\frac{9}{32}$″ hole in the center of the bottom and countersink this hole from the bottom. With the stand in a vertical position with respect to the horizontal bar of the frame, fashion a brace of channel to run between the center of the stand and the mudguard attachment bar.

The front "A" frame stand is the next step. A 5′ 6″ length of ⅜″ pipe is flattened at the center for about 2″ and then bent. Now drill a $\frac{13}{32}$″ hole at the center of the flattened area. Next cut a 10½″ length of angle or channel and drill ½″ from each end and at the center with a $\frac{9}{32}$″ drill. Then make two clips from $\frac{1}{16}$″ metal and assemble these around the pipe and into the cross-bar with ¼″ bolts. Cut another brace similar to the rear brace and drill the frame to receive one end and bolt the other end to the center of the cross-bar. (See drawing on next page.)

[*Continued on page* 134]

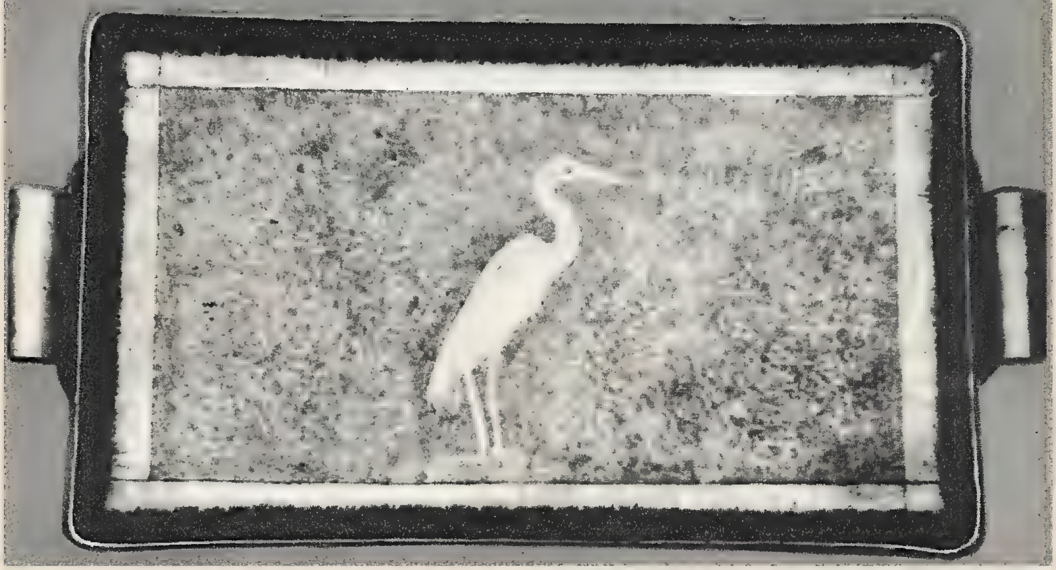




Any old bicycle frame is suitable for the construction of this exerciser. The construction is simple as shown by the accompanying drawings, and the parts usually can be found in any junk yard. When completed, the machine should be enameled in an attractive contrasting two-color combination.

1/16"
9/32" HOLE
1"
DETAIL OF CLIP "A"
1/8"
BRACKET "B"
1 1/4"
7/32" HOLE
1"
PATTERN FOR SADDLE — MAKE FROM 7/8" PLYWOOD
1" SQUARES
HANDLE BAR 1/2" PIPE
FLATTEN
WOOD PLUGS
3/8" BOLTS
RUBBER GRIPS
9"
9"
11"
CLIP "A" (SEE DETAIL)
9 1/2"
ANGLE OR CHANNEL
26"
26"
RUBBER FOOT
ANY FRAME
BRACE
SADDLE
BRACKET "B"
SHOE
TENSION ADJUSTMENT
BRAKE LINING
1/8" BOLT
BRACE
BRACKET
SPRING
3/16" BOLT
1/4" PIPE SPACERS
3"
13"

A HAND TOOLED ALUMINUM SERVING TRAY

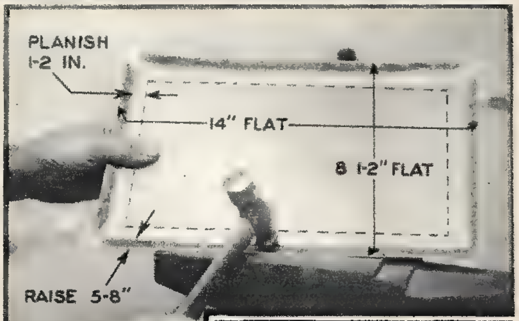


THE most popular article in art shops today is the aluminum serving tray in imitation hand hammering and hand tooling.

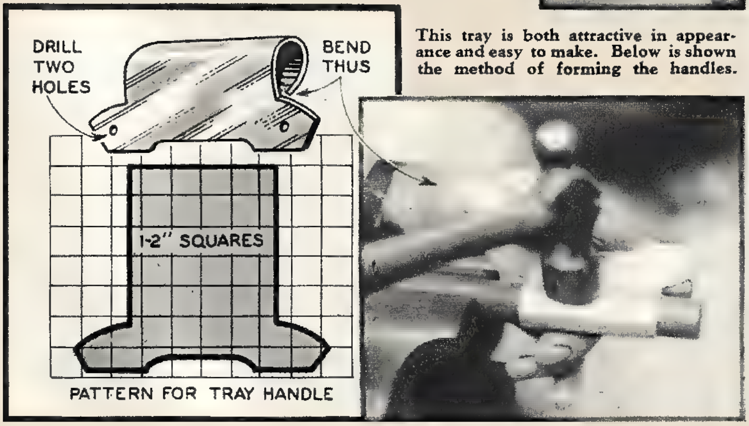
The making of an aluminum tray by hand hammering and hand tooling is very simple, and a hand-made tray is prized more than one that is stamped out.

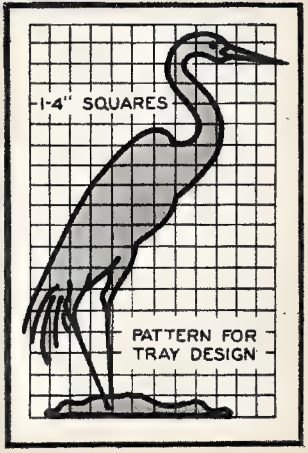
The tray illustrated is hand hammered and hand tooled. The blank is cut from 16-gauge

[*Continued on page* 137]


PLANISH 1-2 IN.
14" FLAT
8 1-2" FLAT
RAISE 5-8"

This tray is both attractive in appearance and easy to make. Below is shown the method of forming the handles.


DRILL TWO HOLES
BEND THUS
1-2" SQUARES
PATTERN FOR TRAY HANDLE


1-4" SQUARES
PATTERN FOR TRAY DESIGN

The MI

Left—Soft voiced instruments such as violins and guitars are particularly suited for use with the amplifier. As shown in the photograph, the microphone is not easily noticeable when placed in position on the instrument.

Below—A front view of the completed amplifier. The volume control and microphone jack are located on the right side of the carrying case. A wire grille in front of the speaker cone protects it against accidental damage.

HERE'S a new amplifier designed especially for musical instruments. With it, the thin, weak tones of an ordinary violin acquire the depth and power of a Stradivarius; the guitar, mandolin and ukulele swell forth with startling brilliance and tone richness; the tiny spinet produces the volume of a concert grand! Even tap dancers can now put their stuff over in a big way.

The entire apparatus is light, portable and completely self-contained. It may be used any time, anywhere and on any musical instrument. It is simple to build and can be assembled by the average experimenter for less than twenty-five dollars including tubes, microphone and cabinet. And, by simply plugging in a different microphone, the apparatus becomes an excellent public-address system with plenty of power for the average hall. Any high-impedance pickup can be used, adapting the outfit to phonograph record reproduction.

Musicians have had difficulty in using ordinary public-address systems for amplifying musical instruments in most public places. The microphone would pick up not only the music but also background noises which often destroyed the effect. Further, considerable care was necessary in the placement of the speaker or the sound would bounce back into the microphone and create a howl. These troubles are avoided in this outfit by the use of a special microphone which is completely sealed and is sensitive only to sound vibrations picked up from the instrument with which it is placed in contact. This microphone is a tiny affair, only an inch wide and a half-inch high, moulded in a soft rubber case so it may be tucked under a violin tail-piece or fastened with rubber bands or rubber cement to any other instrument without damaging the surface of the instrument in any way. The natural tone of the instrument is not changed; the response of the microphone is rated flat within 1 db from 60 to 6,000 cycles—from an octave above the lowest note on the piano to nearly an octave above the highest note.

The input tube is a 6N7, which contains two medium high-mu triodes in a single envelope. These are cascaded to give two stages of amplification in a single tube. The measured gain is 30 per stage, so we get far more gain from this arrangement than can be had with a single pentode or any two ordinary triodes.

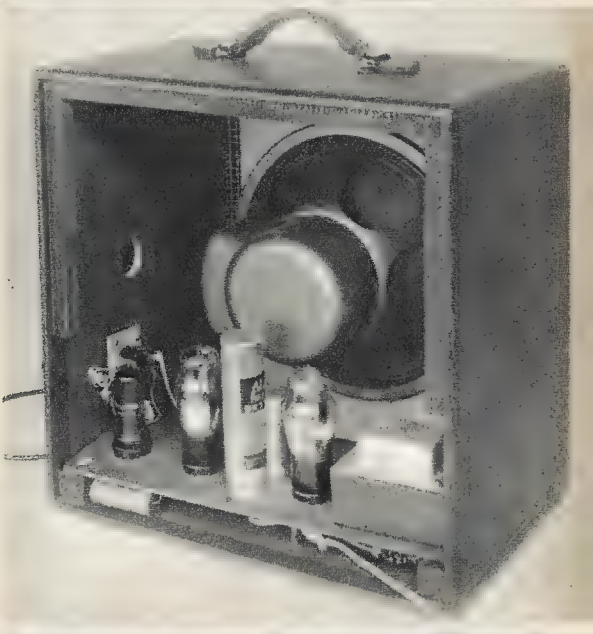
[*Continued on page* 140]

Music Booster

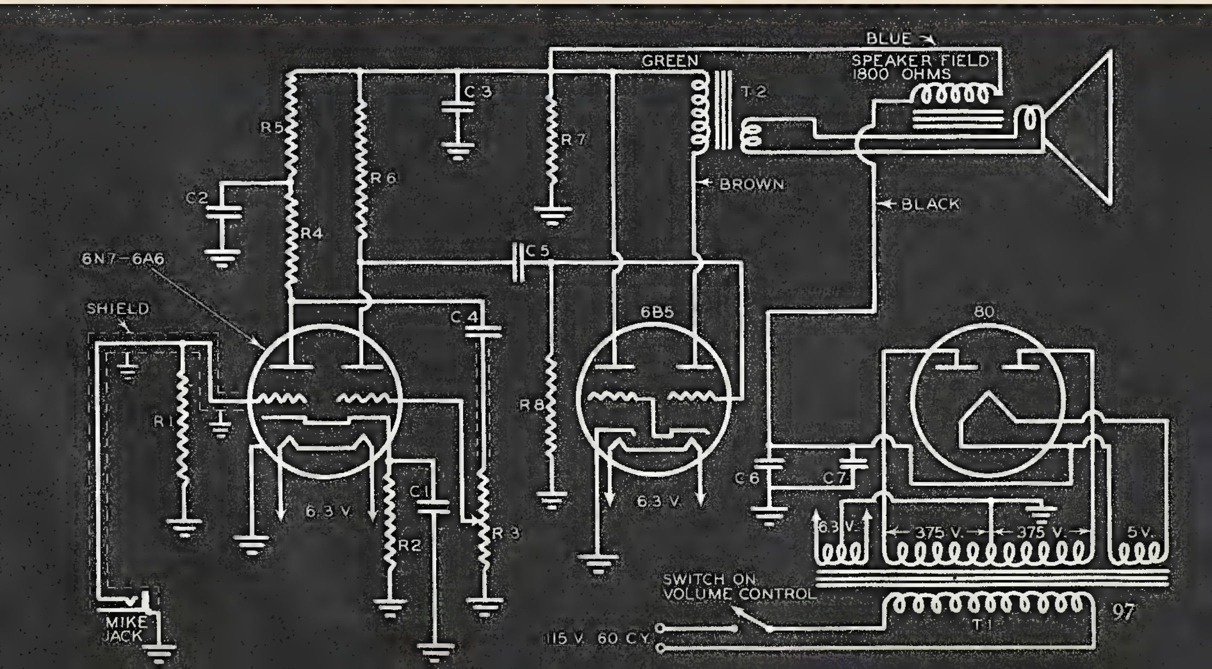
by John H. Potts

Parts List

C1—Aerovox electrolytic condenser, 25 mf., 25 v., type PB25
C2, C3—Aerovox electrolytic condenser, 8-8 mf., 450 v., type 2GLS (both in one can)
C4—Aerovox mica condenser, .01 mf., 1,000 v., type 1,450
C5—Aerovox mica condenser, .02 mf., 1,000 v., type 1,450
C6, C7—Aerovox electrolytic condenser 8-8 mf., 450 v., type 2GL (both in one can)
R1—Carbon resistor, 500,000 ohms, 1 watt
R2—Carbon resistor, 2,500 ohms, 1 watt
R3—Volume control with switch, audio grip taper, 500,000 ohms
R4—Carbon resistor, 200,000 ohms, 1 watt
R5—Carbon resistor, 50,000 ohms, 1 watt
R6—Carbon resistor, 250,000 ohms, 1 watt
R7—Wire-wound resistor, 40,000 ohms, 10 watts
T1—Power transformer, primary 110 v., 60 cy.; sec. 700 to 750 v., c.t., @ 70 to 90 ma.; 5v., 3a.; 6.3 v., 3a., c.t.
T2—Output transformer (supplied with speaker)
Wright-DeCoster 10-inch dynamic loudspeaker, type EIOKU, with tapped field coil and universal output transformer
Amperite Kontak microphone, type SKH, complete with 20-foot shielded cable
Acratone speaker carrying case, 15x15x10, type no. 13789, for single speaker
1—jack, single circuit, for microphone
1—phone plug
1—mounting base for amplifier, wood or metal, 14¼x4 inches
1—piece Celotex for speaker, 12x12x¾ inches
3 tubes (1-80, 1-6B5, 1-6N7)
3 sockets (1-octal, 1-6 prong, 1-4 prong)
Push-back wire, wood and machine screws and nuts



Above—A rear view of the amplifier showing the location of the parts. The power transformer is at the extreme right with the rectifier tube and filter condensers next. Below is the wiring diagram.

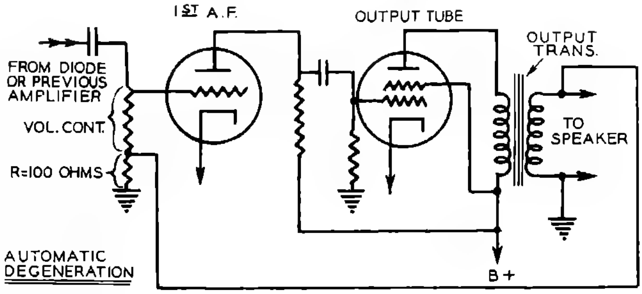

BLUE
GREEN
SPEAKER FIELD 1800 OHMS
C3
T2
R5
R7
R6
BROWN
BLACK
C2
R4
C5
6N7-6A6
SHIELD
C4
6B5
80
R1
R8
C6
C7
C1
6.3 V.
6.3 V.
6.3 V.
375 V.
375 V.
5V.
R3
R2
SWITCH ON VOLUME CONTROL
MIKE JACK
115 V. 60 CY.
T1

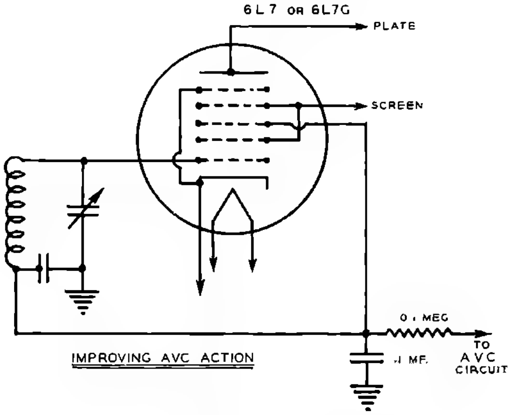
RADIO SPARKS

Improving Quality

THE scheme shown in the attached figure has been used to vary the amount of degeneration in such a manner that when weak signals are received, the amount of degeneration is nil; and when strong signals are received, degeneration is maximum. Thus, for weak signals, sensitivity is high and quality is normal; for strong signals, quality is considerably improved and sensitivity is reduced, but reduced sensitivity is not detrimental when you have a strong signal.

This apparently magical accomplishment can be had in most cases for the cost of a 100 ohm resistor and a little time. As shown in the diagram, merely ground one terminal of the voice coil and connect the other terminal to the junction of the 100 ohm resistor and the volume control. If reception is worse, then merely reverse the terminals of the voice coil. With this connection, the amount of degeneration varies automatically with the setting of the volume control.


1ST A.F.
OUTPUT TUBE
OUTPUT TRANS.
FROM DIODE OR PREVIOUS AMPLIFIER
VOL. CONT.
R=100 OHMS
TO SPEAKER
B+
AUTOMATIC DEGENERATION


6L7 OR 6L7G
PLATE
SCREEN
0.1 MEG
TO AVC CIRCUIT
.1 MF.
IMPROVING AVC ACTION

Manual Fidelity Control

THE diagram at right shows how a fidelity control can be added to your present receiver.

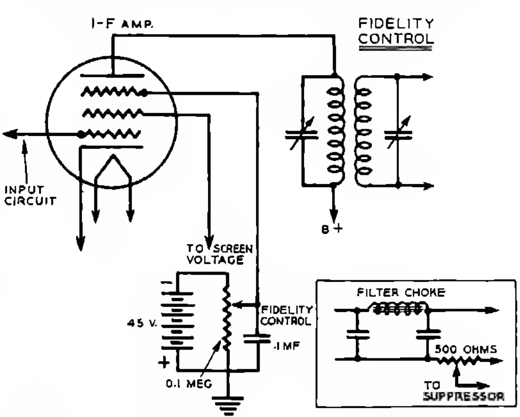
The intermediate-frequency amplifier tube is a pentode with its suppressor-grid lead connected to ground or cathode. In either case, disconnect it and reconnect to the arm of the potentiometer, being careful to note the polarity of the battery. Maximum fidelity is obtained when the arm of the potentiometer is near the negative terminal of the battery; normal fidelity is obtained with the potentiometer at the ground end.

It is possible to obtain the 45 volts from the B supply unit as shown in the insert.

Increasing AVC Action

MANY home and auto sets do not have enough automatic volume control action to take up severe fading or severe overloading on strong signals.

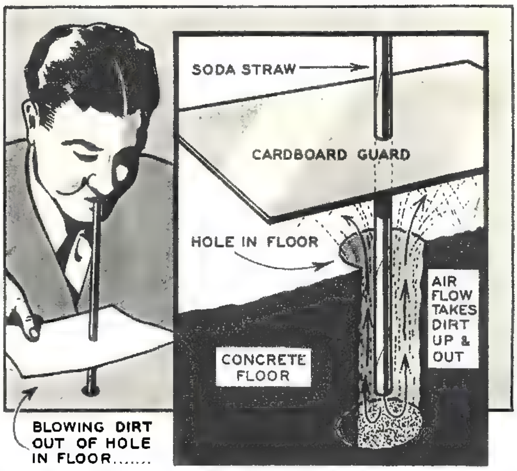
The 6L7 is a five-grid tube having two control grids: a sharp cut-off grid and a variable-mu grid. The signal is fed only to the variable-mu grid in the conventional fashion, but the avc voltage is fed to both grids at once. Because the avc voltage acts on both grids, only about 15 volts is required to cut off the tube; at the same time, the signal operates on a remote cut-off grid, so that distortion in the r. f. amplifier is a minimum. This arrangement is possible only with the 6L7 type of tube.


I-F AMP.
FIDELITY CONTROL
INPUT CIRCUIT
B+
TO SCREEN VOLTAGE
45 V.
FIDELITY CONTROL
.1 MF
0.1 MEG
FILTER CHOKE
500 OHMS
TO SUPPRESSOR

KINKS SIMPLIFY SHOP TASKS

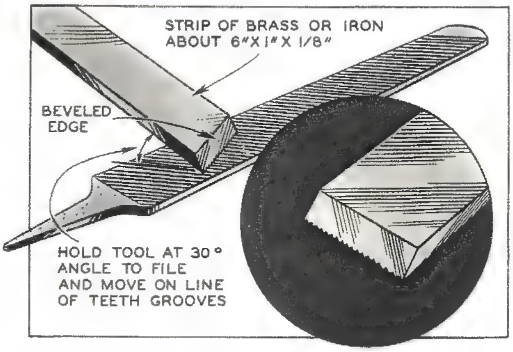
Soda Straw Cleans Holes

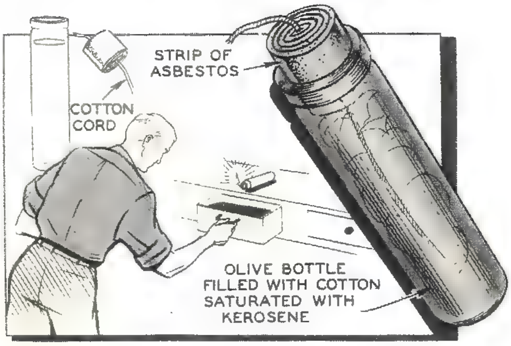
WHEN holes are being drilled in stone or cement it is usually difficult to remove the constantly accumulating dust and small particles at the bottom of the hole. This difficulty can be eliminated easily and quickly by using an ordinary soda straw and guard for blowing it out as shown by the drawing at the right. The guard should always be used, because without it some of the dust probably would be blown into the eyes. If dust is not removed from the hole, the drilling operation is slowed up considerably.—Andrew Vena.


SODA STRAW
CARDBOARD GUARD
HOLE IN FLOOR
AIR FLOW TAKES DIRT UP & OUT
CONCRETE FLOOR
BLOWING DIRT OUT OF HOLE IN FLOOR......

Easily Made File Cleaner

WHEN working soft metals the home craftsman usually finds that his file clogs very quickly. If a stiff wire brush is not available, a small piece of brass or iron stock will do the work just as well. When the brass is rubbed over the file, the teeth quickly cut grooves in it, thereby pushing out the accumulated metal. The scrap metal should measure about six inches long, by one inch by ⅛ inch. One end should be beveled to about a 30-degree angle.—K. F. Keith.


STRIP OF BRASS OR IRON ABOUT 6"X1"X 1/8"
BEVELED EDGE
HOLD TOOL AT 30° ANGLE TO FILE AND MOVE ON LINE OF TEETH GROOVES

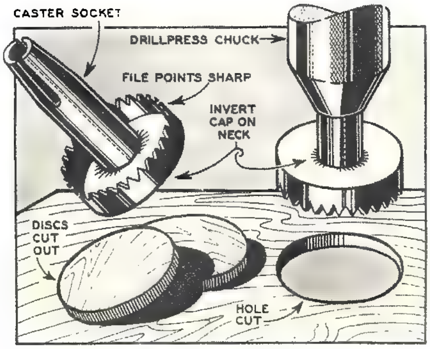

STRIP OF ASBESTOS
COTTON CORD
OLIVE BOTTLE FILLED WITH COTTON SATURATED WITH KEROSENE

Olive Bottle Becomes Candle

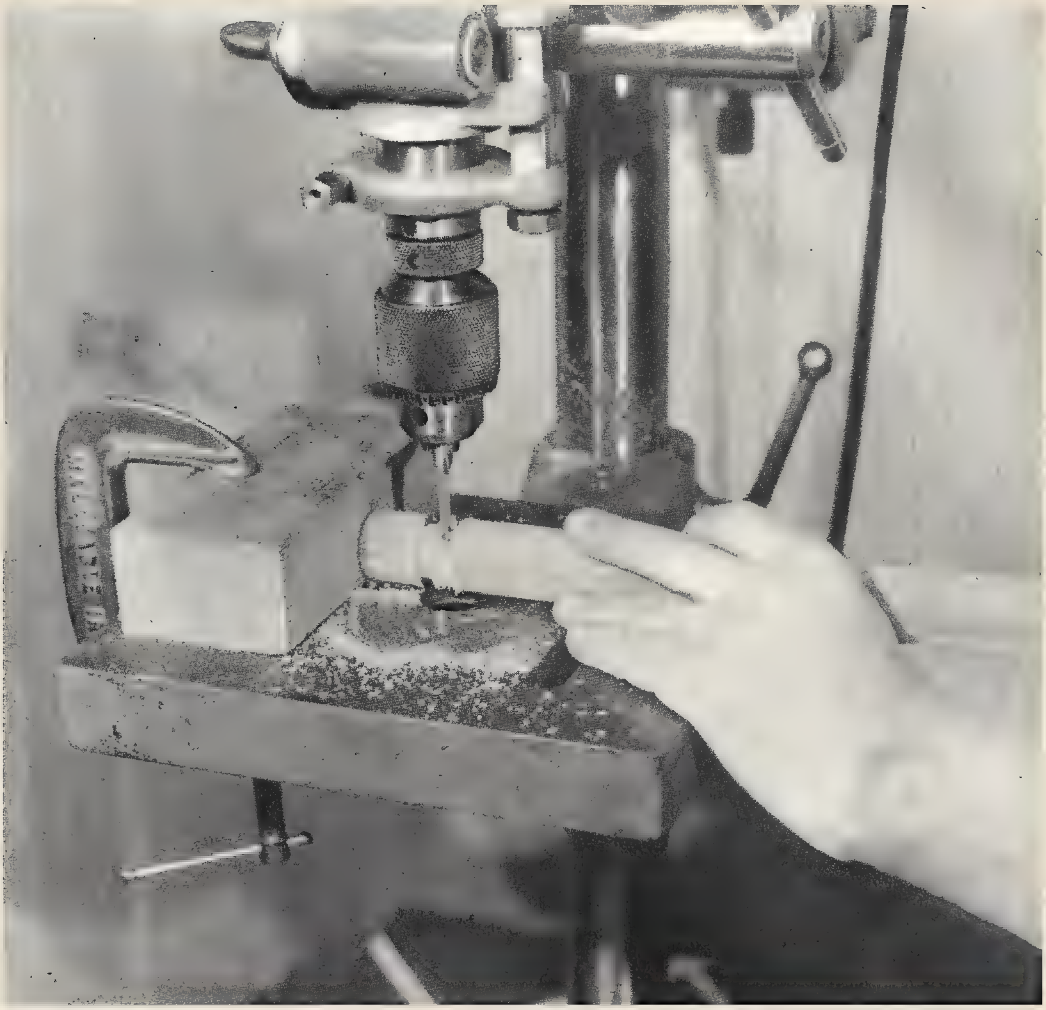
AN EMPTY olive bottle can be used for making an excellent emergency candle for shop work. The bottle is packed with cotton which is then saturated with kerosene. A cork is made from a small piece of asbestos rolled up to fit the neck. A soft piece of cotton string serves as the wick.—A. Tempe.

Circle Cutting Saw From Caster

FOR cutting holes from thin material when a regular cutter is not available, a simple substitute can be improvised from the saw edge cap of an ordinary caster socket. The cap is removed and inverted on the neck of the socket to form a shank to be inserted in the chuck of a drill press. By filing the teeth of the cap to a saw edge, this cutter will produce a clean cut hole or disc in any soft or hard wood.—W. C. Leckey.


CASTER SOCKET
DRILLPRESS CHUCK
FILE POINTS SHARP
INVERT CAP ON NECK
DISCS CUT OUT
HOLE CUT

MAKE YOUR OWN



ATTRACTIVE and durable curtain fixtures are easy to make. The end brackets can be cut out of pressed-wood, plywood, or scrap pieces of ½-inch stock of almost any kind, with the aid of a coping saw. The pattern suggested on the following page is a good one to follow. Cut one such bracket first, sand its edges smooth, and then use this as a master pattern in marking out as many additional ones as needed.

Smooth poles of 1 and 1⅜-inch diameters, which are the most popular sizes, are obtainable for about three cents a foot at most lumber yards. Mount the brackets to the window frames and then cut the poles so that they overhang about an inch on each side. Carefully mark the positions of the brackets on the poles, so that you can cut grooves into them at these points. The rods will thus hang perfectly without shifting when the curtains are handled.

Groove-cutting sounds like a lathe job, but few home lathes will accommodate poles 40 inches long, which is a representative length for average windows. Just as good a job can be done on a drill press, with a ¼-inch routing tool. The above photograph shows the set-up. A short piece of 2x3 is clamped to the drill press table so that it acts as a stop, being placed to bring the edge

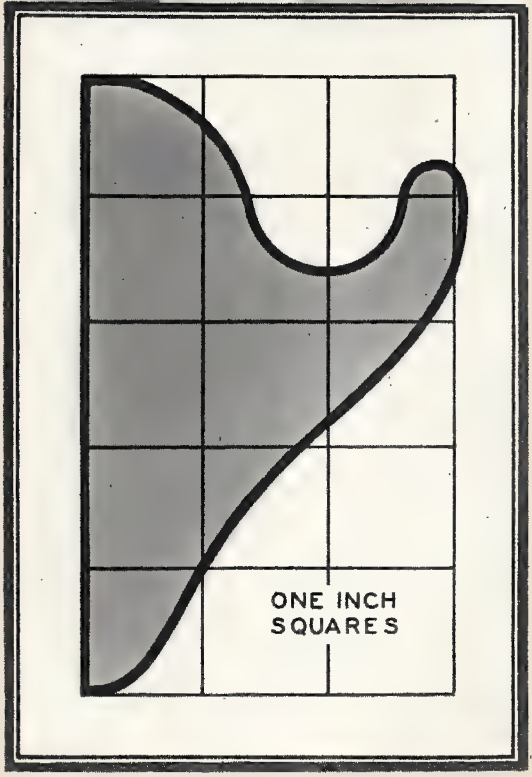
CURTAIN FIXTURES

Right: A T-shaped jig is a big help in making the brackets. The upright piece is clamped in the vise, and the horizontal member has a slot in its end, through which the blade of the coping saw passes. Left: Practice on a scrap piece of curtain pole before cutting the grooves in the long rods.

of the routing cutter to the outer pencil line on the pole. Lock the spindle so that the cutter will dig about ¼-inch into the wood and set the drive pulleys for highest speed. Now, pushing the pole firmly against the block, rotate it slowly into the cutter, taking small bites at a time. To widen the groove, reset the block to the left, and repeat the feeding operation. If the pole is held flat on the drill press table and fed in evenly, a perfect groove will be obtained.

Rings and pole end pieces can be turned on a lathe, and make a nice exercise for the skilled wood turner, or they can be bought ready made for a few cents each.

The finish of the fixtures will depend on the color scheme of the room and of the curtains. If the walls and the window frame are light colored, an attractive combination consists of natural redwood poles and end pieces coated merely with shellac, and white rings and brackets.



Above—This simple pattern is suggested for the end brackets. Left—A window with curtain, rod and brackets all in place. Hook-type pins hold the curtain proper to the rings.

SELECTING

Canadian Pacific Photo

Campfires are not limited to the summer months. A good fire can be built on snow-crusted ground, as is evident in the picture above. Winter fires should be built on a row of slow burning logs. White ash is an exceptionally good wood that burns with a clear, even flame. Below—White birch bark, gathered in a basket, and stored under the camp porch, provides excellent fuel for kindling the campfire.

ITS behavior in a real, baking fire is the acid test of any wood, whether it is to be used for fireplace burning, outdoor cooking or fuel in the cabin range.

The sportsman should know his trees. Some woods burn well green while others fail miserably. Certain trees can be cut and chopped green or dry; others axe so hard when seasoned that to use them would be scarcely worthwhile.

The upland guides' golden rule for firewood collecting is to never, even in dry weather, gather wood that is lying on the ground. Seasoned dead wood, and plenty of it, may be found standing or suspended in bushes or low trees, but any lying directly on the ground will be either doty or waterlogged.

Kindling is the first requisite of fire building, often being a problem in wet or snowy weather. Many barks ignite easily, white birch being particularly good in this respect. If the weather isn't too cold it can be easily peeled from the tree, but in winter it is better to pull off a few handsfull of the dirty looking shedding bark and use it with splinters from a lightning struck tree, or the dead top of a small evergreen. Always gather your morning fire starting wood the night before, whittling a few kindling sticks to tuck in a dry spot away from the night dew. The next morning use a candle to get them going.

WOOD for the CAMPFIRE

by
Bert James

In localities where stones are easy to obtain, a more permanent fireplace can be erected. A grill plate across the top supports utensils. In instances where a grill is not available, green limbs may be substituted.

The sportsman can manage very well, even in fall, with standing dry stuff, but for real cold weather use only seasoned hardwoods, or those which burn well green will heat the winter cabin or keep the open camp warm. Selection of wood in winter becomes important and gathering, something that should be tackled seriously.

Hardwoods are noted for their ability to hold fire. Hickory is perhaps the best. This distinctly American wood burns well, seasoned or green, splits easily when cut, but is a son-of-a-gun once it dries. Most of the oaks perform well, white oak especially. Yellow birch and white ash burn even better green than seasoned. The latter is always worth cutting, for it is not only easy to tote, but burns with a clear, even flame, longer than most woods. Woods which burn well in winter, when the sap is down, may perform poorly in summer. All trees growing on high, dry ground yield better firewood than those, of the same species, found in wet, moist places.

White birch and northern alder burn satisfactorily only when comparatively green. On the other hand, aspen, black ash, tulip poplar, sassafras, balsam, hemlock and pitch pine will hardly burn at all when cut. Cherry, most hemlocks and locusts are hard to split. In addition to hickory, beech, dogwood, sugar maple and slippery elm are good woods that are easily chopped when green, but difficult when seasoned.

The great majority of softwoods, if dry, are good only for kindling and quick cooking fires. As their burning time is short, they are apt to smoke and throw off sparks which, unless put out, hold fire long enough to do damage. Resin-filled knots of the pine and balsam are always worth gathering if only to throw on the fire when lounging about it after supper. Especially in the southern highlands these can

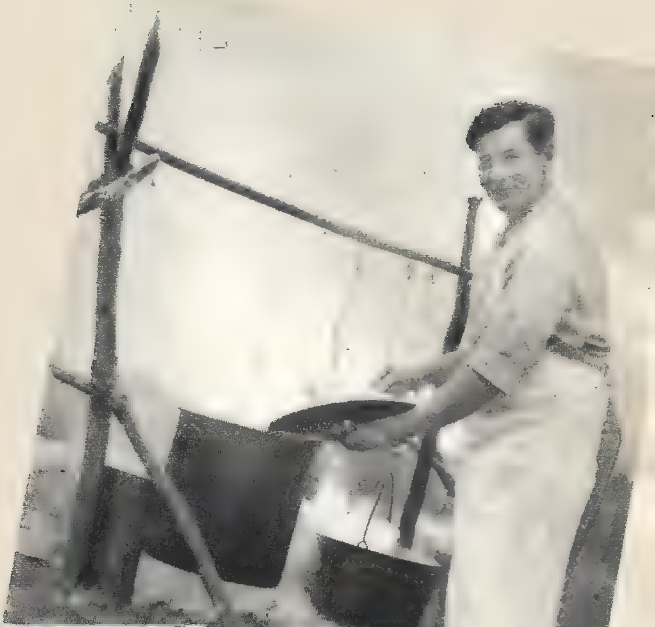
Summer fires should be built between two rows of stones. Forked green limbs and poles are used to support the cooking utensils.

be found on the ground, and in rotted trees, where they lie for years almost imperishable.

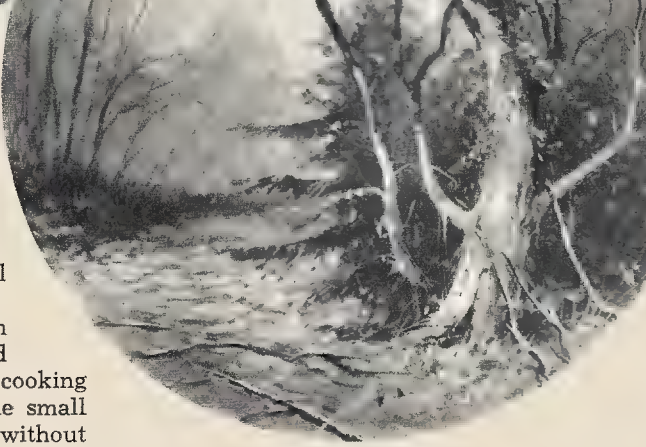
The summer cooking fire should be built between a pair of six-inch green logs or a double row of stones, if the latter are available, so that cooking utensils may be kept up off the coals. Failing this, dig a trench, allow it to fill with hot coals and cook over it. If you use none of these, but build your fire in the open, erecting a rack of forked and straight green poles to hook your pots over, fit your frying pan with a long green pole handle so that it can be kept the correct height above the coals.

Never attempt cooking over smoking flames. Wait until the wood has burned down to coals or, if a big warming fire as well is necessary, rake hot coals to one side for cooking use. It is surprising how well a small fire suffices for light cooking. The secret is to use only wood which will burn down to hard hot coals, then keep these raked so that the slightest breeze will fan them to a fiery heat.

Logs and even poles burn best when split. Poles may be left long and [illegible] into warming or large cooking fires as they burn away, but for the small blaze, short lengths handle better without stirring up ashes to interrupt cooking. These tips insure successful outdoor cooking.



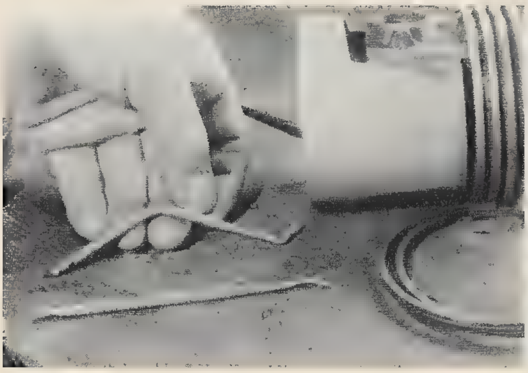
The professional camp cook prefers to do his cooking outdoors, using a rack of forked and straight green poles as a support for kettles. This type of rack is usually chosen by sportsmen because of its simplicity.

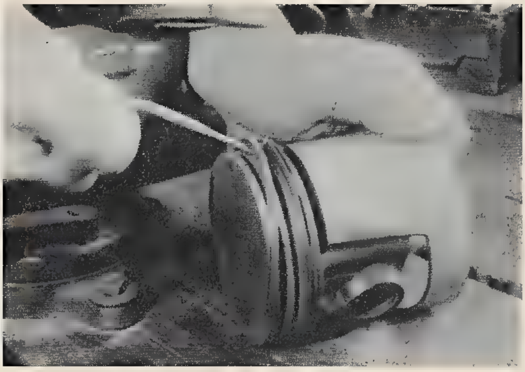


When gathering wood for the campfire, never pick up wood that is found lying on ground; it will not burn! Good wood is that found standing or suspended in bushes and low trees.

TIME SAVING AUTO KINKS

Bent Nut Pick Simplifies Removal Of Piston Rings

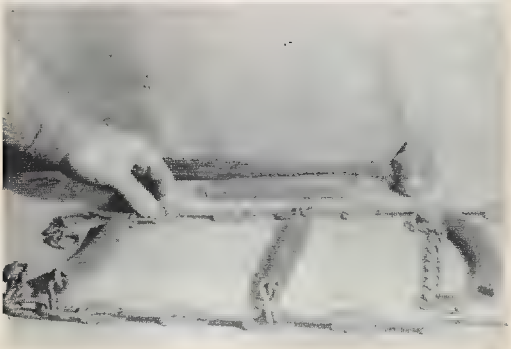




AN ORDINARY nut pick can be converted into a handy tool that will facilitate the removal or replacement of piston rings. The pick should be bent to the shape shown in the photograph above by placing it in a vise and applying pressure at the two indicated points on the shank. To remove a piston ring with the bent pick, merely slip the sharp edge under the ring and exert pressure to thread it over the top of the piston, the lower bend of the pick following the ring groove as shown. When replacing rings, the pick is used to slide them over the grooves and other rings without distorting their true circle shape.

Rubber Covers Increase Life Of Tire Chain Links

FITTING short lengths of rubber tubing or garden hose over the cross link sections of tire chains provides better traction in mud or snow, makes the chains noiseless in operation and increases the life of the links. To fit the rubber tubing over a cross link section, remove the side wall hook by spreading it with a hammer and chisel, leaving an open hook as shown on top of the vise in photo. Slip the rubber tubing over the cross link section by pulling the section through it by means of a piece of heavy wire attached to the end hook, as shown in photo. The tubing should be long enough to cover the cross links but not the side hooks, which hold the section to the chain proper, providing enough tension to hold the chain so it will not be loose on the tire. The photo at lower right shows a tire chain in which two of the cross link sections have been fitted with lengths of garden hose while a third section has been unhooked on one side in preparation for slipping on the piece of garden hose. It will only take about an hour to completely fit your tire chains with the rubber tubing, as explained above, but it may save you many hours of trouble on the road, to say nothing of sparing your nerves because of their silent operation.



Unravel Secrets of Bee

MANY indeed are the masterpieces of writing that have been devoted to the honeybee—poetical, literary and scientific. From earliest times the complex hive behavior and manifold duties afield of these small social animals and the real or fancied comparison of their busy careers with human life in a great city have intrigued mankind. One may have hours of pleasure by observing bees, but the full extent and meaning of their activities can be appreciated only by those who have taken the honeybee apart and made of her a number of microscope slides in order to gain a bee's eye view of her most ingenious construction.

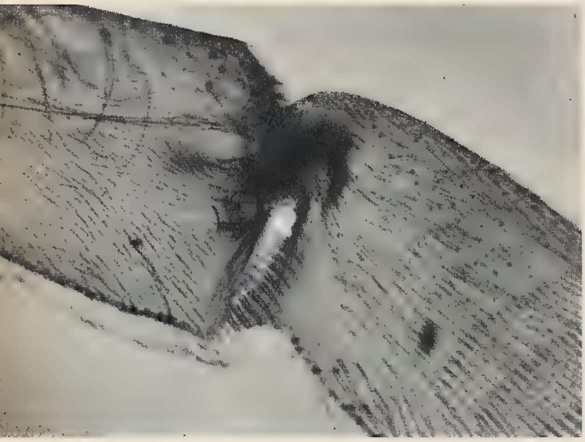
Also it is quite amazing to discover how many different mounts and studies—all interesting—can be made from a single individual of so small a creature. If you own a microscope and make your own slides, you may have at some time mounted a wing or leg and thought you knew the whole story.

To begin with there are three castes: the queen, drone and worker, each with distinctive structures. Then there are the life cycle stages: egg, larva, pupa and adult, with features peculiar to each stage. From the environmental and economic sides there are enemies, diseases and parasites of bees, and there are the various ingredients used and products made from them, as pollen, nectar, honey and wax. By no means all of the possible preparations would interest those who are not professional beekeepers or research scientists, but there still remain a goodly number of general importance.

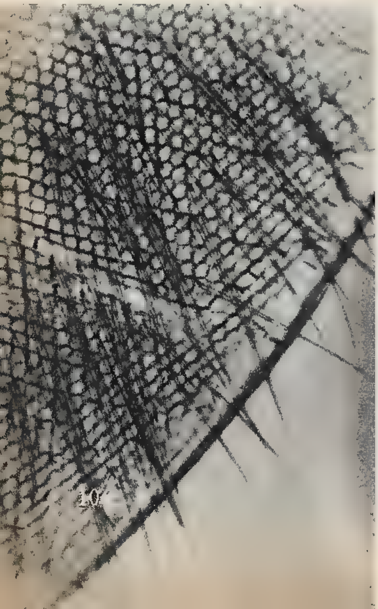
Three types of slides will be discussed as examples. Specimens of bees are obtainable almost everywhere at all seasons, but if you live in a city and cannot locate them in parks or flower gardens, they may be purchased as preserved specimens for a few cents. An insect net and cyanide bottle are not necessary if you do not have them, since a bee engaged in sipping nectar from a flower is easily and safely captured in a bottle half-filled with 70 to 80% alcohol by merely trapping between bottle and cork, and the fluid will both kill and preserve. For collecting in quantity the best mixture of all, because it preserves but leaves the insects flexible, is one-third 95% alcohol, one-third glycerine, and one-third water.

Using a pair of forceps on a dead specimen

Above—Pressing the bee's abdomen protrudes the sting so that it can be grasped with a tweezer and removed.



Above—The third leg of a worker bee showing pecten (comb) in center, at joint, and pollen comb at right.



The bee is a hairy insect! At left is shown the surface of the eye of a honey bee. Note the many facets. The honey bee is indeed a masterpiece of engineering and architecture, and has been described as a bundle of adaptations.

Life With Microscope

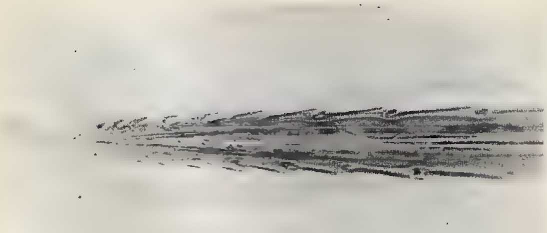
by Julian D. Corrington, Ph.D.

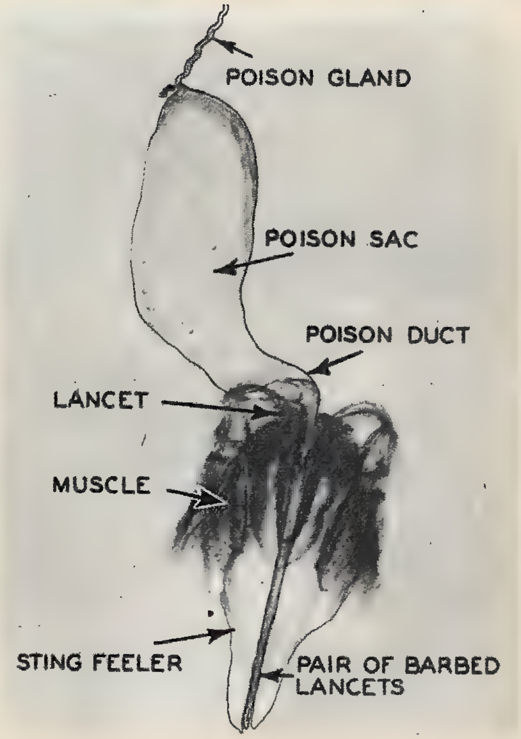
of adult worker bee, wet or dry, remove a hind wing and place in the center of a clean slide. Add a few drops of 95% alcohol and keep the wing covered with this fluid over a period of five minutes. Drain by tilting the slide, then place carbol-xylol on the wing for five minutes more. Do not allow these liquids to evaporate completely at any time. Finally, drain off the xylol and add a drop of balsam, then apply the cover glass. Set aside to dry or put in a slide warmer until the balsam has solidified.

Examination will show a row of minute curved hooks running along the front margin of this rear wing. If a similar slide of the front wing is made, you will find a fold in the rear margin forming a trough into which these hooks engage in order to hold the two wings of one side together in flight, strengthening the flying apparatus. The number of such hooks varies from seventeen to twenty-six, averaging twenty-one. Numerous statistical studies have been made of this variation with the result that drones have been found to exhibit greater variability than workers, that a given bee does not inherit a set number of hooks but only a capacity to have anywhere from seventeen to twenty-six, and that it seems to make no difference as to survival value in competition among different bees as to how many hooks they may have, within these limits.

A second type of slide introduces the technique known as potashing. Remove the three legs from one side of the body of a worker

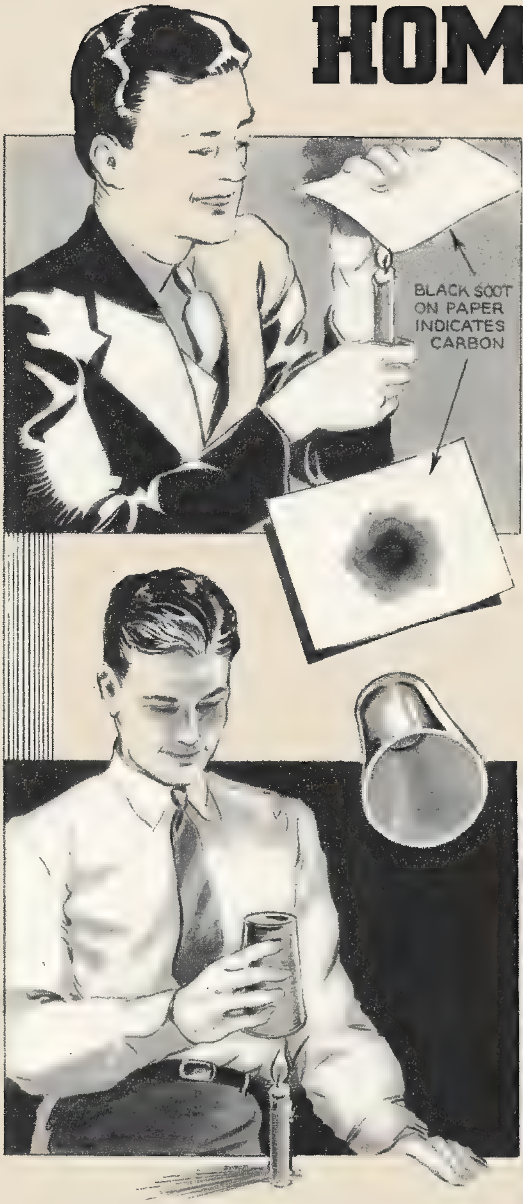
[*Continued on page* 140]



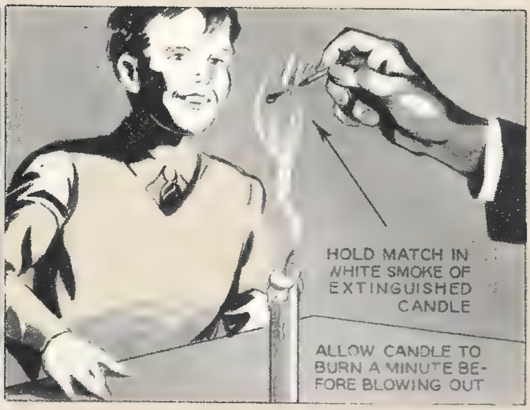


Top right—Using the microscope's lowest power while arranging the bees legs for mounting. **Below**—The barbed darts of the bee's sting, highly magnified. **Right**—Stinging apparatus of the worker honey bee, greatly magnified.

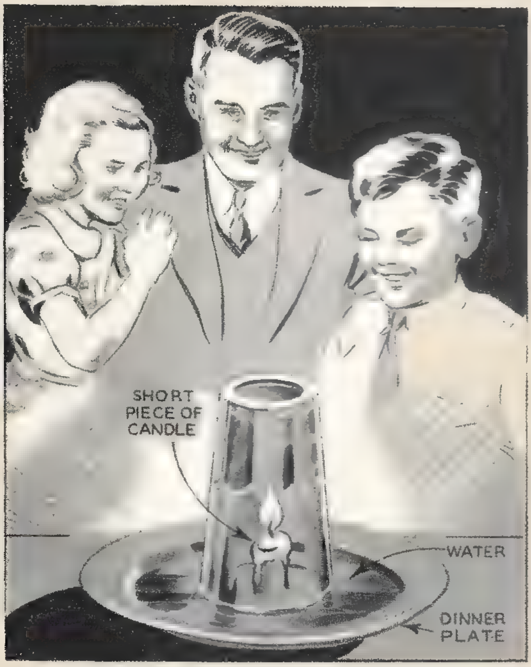
HOME SCIENCE


BLACK SOOT ON PAPER INDICATES CARBON

WHAT ARE CANDLES MADE OF? Light a candle, and for an instant hold a sheet of white paper in the upper third of the flame. A deposit of black soot on the paper indicates that part of the candle consists of carbon. Next, hold a clean cold glass over the flame as shown by the drawing above. It will be found that a mist will collect on the inside, indicating that hydrogen is being burned. Candles of today consist chiefly of paraffin, a hydrocarbon, containing hydrogen and carbon. Before using the glass, be sure that the inside surface is cold and free from moisture. When hydrogen is burned in the presence of oxygen, water is the resultant by-product. If the glass were not held over the flame, the water, in the form of steam, would not be noticed as it would have no cooling surface on which to condense, thus showing its presence.

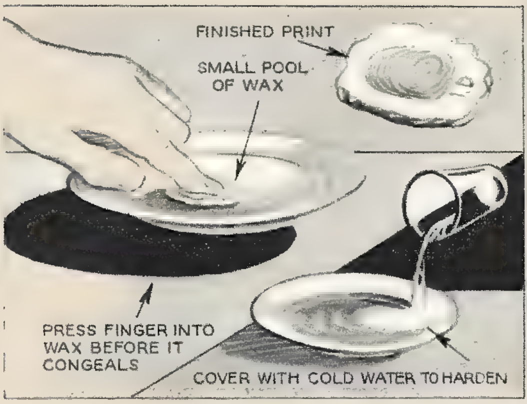

HOLD MATCH IN WHITE SMOKE OF EXTINGUISHED CANDLE
ALLOW CANDLE TO BURN A MINUTE BEFORE BLOWING OUT

MAGIC CANDLE-LIGHTING METHOD. Light a candle, and after it has burned for a minute or two, light a match. Then blow out the candle, and hold the lighted match about an inch over the wick. It will be found that the candle will relight without the match being brought nearer than an inch.

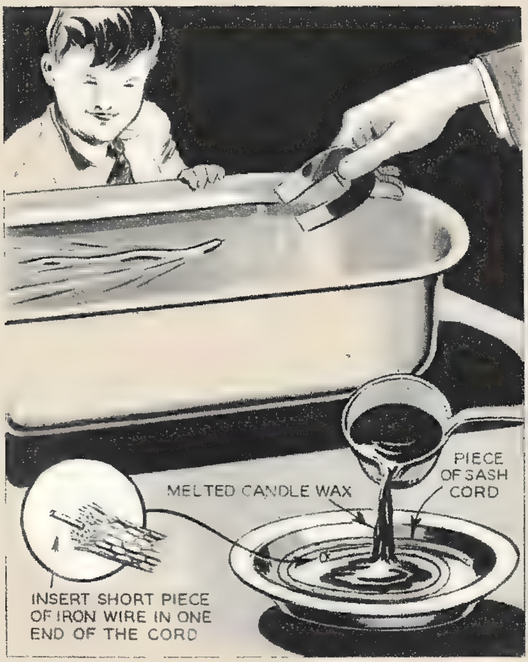

SHORT PIECE OF CANDLE
WATER
DINNER PLATE

A HISSING CANDLE. Fasten a short piece of candle to a shallow plate. Pour into the plate about a half-inch of water. Light the candle and quickly invert a glass over it. In a minute or two a hissing sound will be heard as the partial vacuum, caused by the burning candle, permits the outside pressure to force the water under the glass.

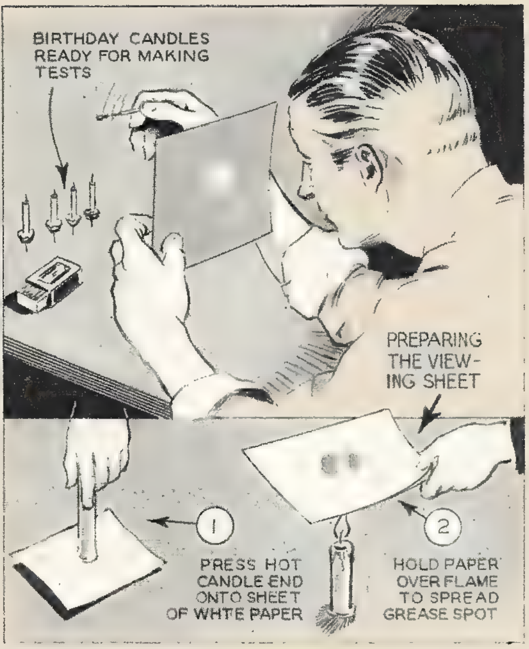
STUNTS WITH CANDLES


FINISHED PRINT
SMALL POOL OF WAX
PRESS FINGER INTO WAX BEFORE IT CONGEALS
COVER WITH COLD WATER TO HARDEN

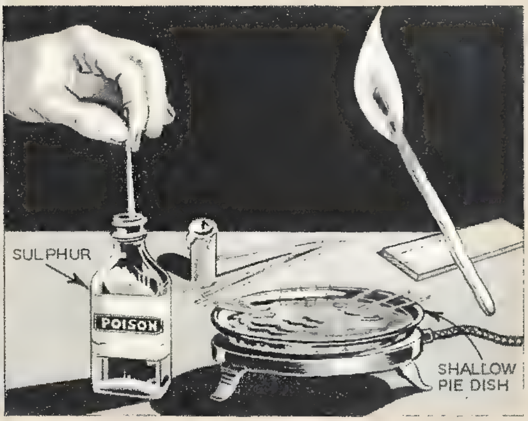
MAKING PERMANENT FINGERPRINTS. Light an ordinary candle and allow a small pool of wax to form in a saucer. While the wax is still in a liquid state, place a finger into it and hold it there until the wax starts to harden. Remove the finger and pour some cold water over the wax. An excellent permanent mould will be the result.


MELTED CANDLE WAX
PIECE OF SASH CORD
INSERT SHORT PIECE OF IRON WIRE IN ONE END OF THE CORD

A SWIMMING SNAKE. Soak a short piece of cord in molten candle grease. When it is uniformly coated, press into one end a short piece of iron wire. Then place the cord into a pan of water, and by holding a magnet near the end into which the wire was placed, it will follow the magnet, swimming like a snake.

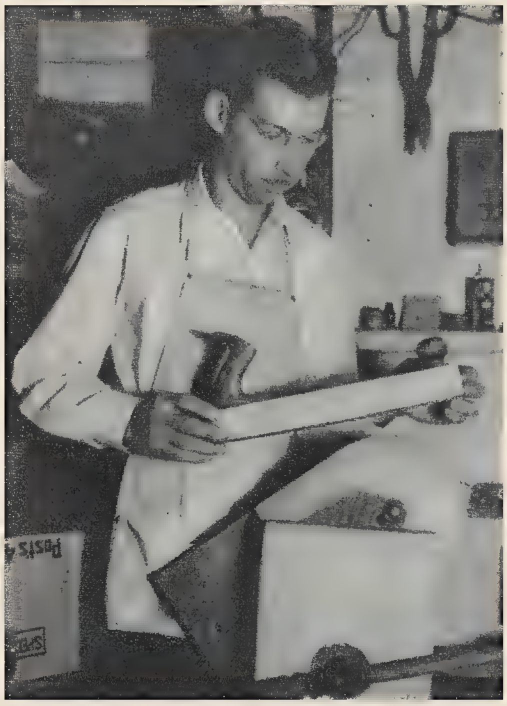

BIRTHDAY CANDLES READY FOR MAKING TESTS
PREPARING THE VIEWING SHEET
1
PRESS HOT CANDLE END ONTO SHEET OF WHTE PAPER
2
HOLD PAPER OVER FLAME TO SPREAD GREASE SPOT

HOW MUCH CANDLE POWER HAS A MATCH? Hold a lighted match behind a grease spot on a piece of paper. Then stand a small lighted candle behind the paper, the same distance away as the match. Compare the brilliance of the light through the spot with the candle and the match. The number of candles required to give the same illumination as the match is the candle power of the match.

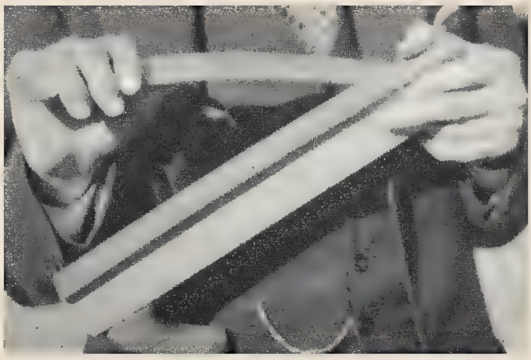

SULPHUR
POISON
SHALLOW PIE DISH

OLD FASHIONED MATCHES. Soak several pieces of soft wood in candle grease, with the exception of about one-half inch at one end. Then dip the "head end" into some powdered sulphur. When this is lighted, notice how it burns with a smooth and steady flame.

Fender File Serves As Excellent Wood Rasp

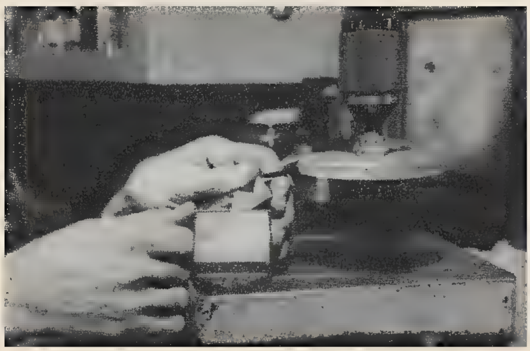


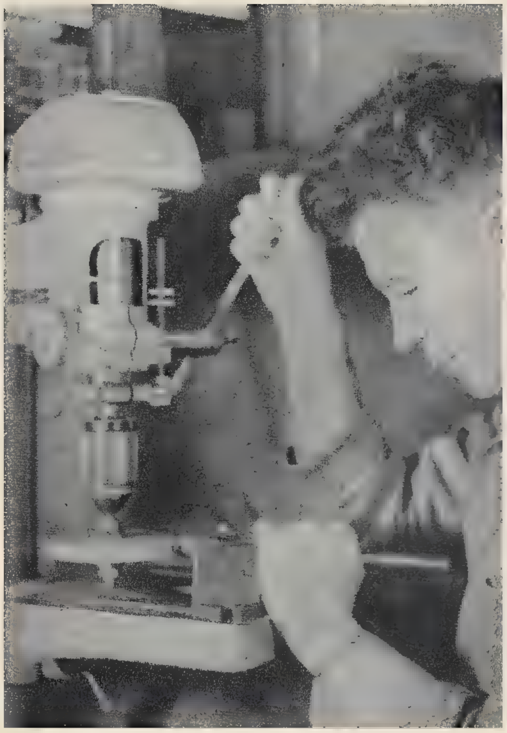
A FAST-CUTTING wood rasp can be made from the flexible file used by body and fender repairmen in smoothing sheet metal. Acting like a row of deep set plane blades, the semi-circular teeth of the sheet metal file remove material with surprising speed and leave as smooth a surface as a regulation wood rasp. Best results are obtained by using a holder to support the blade. At left is shown the file mounted on a block of wood to which is attached old plane handles. Below—A file unmounted and another mounted.



Small Grinding Wheel Increases Drill Press Use

A SMALL emery wheel converts a drill press into a practical and very useful grinder for drills and other sharp edged tools. The varied speeds available make possible efficient grinding of small tools by changing the speed to suit the abrasive and diameter of the wheel. Right—By holding a carborundum stone or diamond holder stationary while the spinning grindstone is raised and lowered, the wheel is brought to a true circle with a straight face. Below—The method of holding a drill bit for sharpening by the grinding wheel.

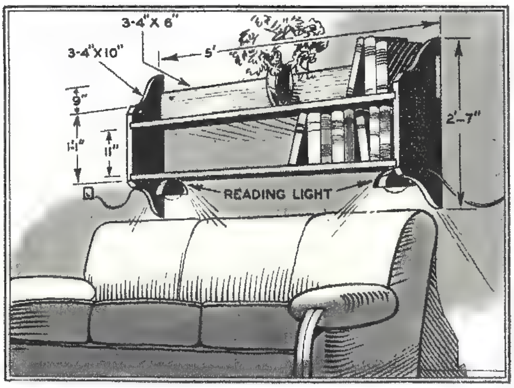




Shortcuts Around The Home

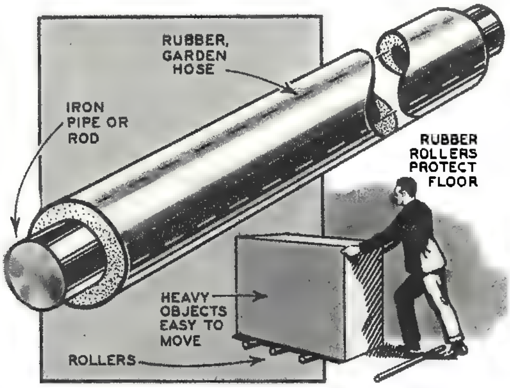
Simple Shelf Easily Made

THIS five-foot book shelf will be found a useful addition to the living room, lending itself particularly to a position above a davenport. If books are not used to fill it completely, there will be plenty of room for a small radio. The ¾-inch shelves are attached to the ends with screws, and the ends are fitted in slots three-sixteenths of an inch deep. Slots are also cut in the back edge near the top of each supporting end to take the ends of the cross board.—G. E. Van Horn.


3-4"X 6"
3-4"X10"
5'
9"
1'-1"
11"
2'-7"
READING LIGHT

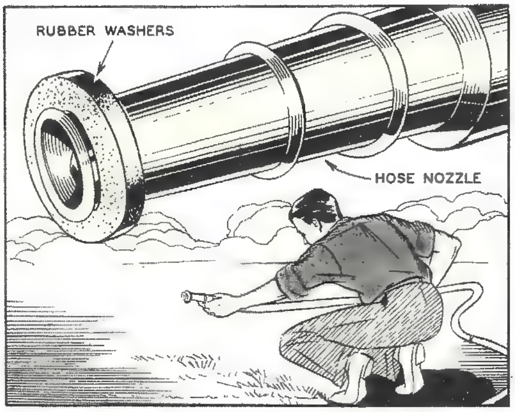
Rubber Hose Protects Floors

SEVERAL lengths of rubber hose cut into short lengths make moving of heavy boxes or furniture easy, without the danger of scratching or otherwise damaging polished floors. A length of iron pipe or rod should be inserted in each piece of hose before it is used.


RUBBER, GARDEN HOSE
IRON PIPE OR ROD
RUBBER ROLLERS PROTECT FLOOR
HEAVY OBJECTS EASY TO MOVE
ROLLERS

Shellac Keeps Cards Clean

TO PROTECT the cards of a recipe file from grease marks, they should be sprayed with a thin transparent shellac, as shown below. They then can be wiped clean without smearing the ink.—A. J. McQueeny.


RUBBER WASHERS
HOSE NOZZLE

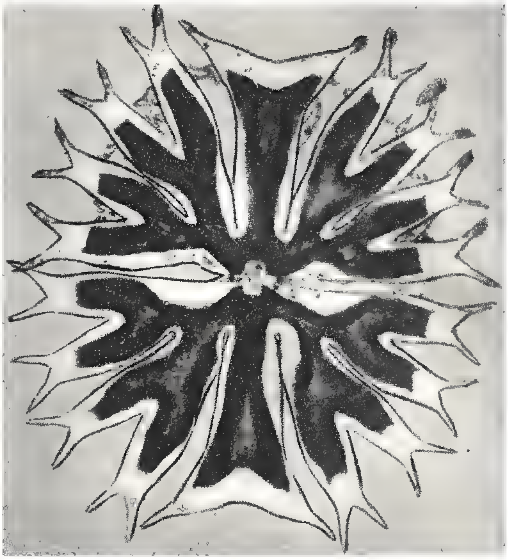
Washer Protects Hose Nozzle

A SOFT rubber washer slipped over the end of the usual brass hose nozzle will prevent it from being burred or dented when it is dropped on stones or sidewalk. The center of the washer will have to be enlarged considerably before it is slipped over the end.

IS YOUR

Nessler's reagent is used for testing for ammonia. When a few drops of this reagent are added to the water, a brown precipitate is formed if ammonia or salts of ammonia is present.

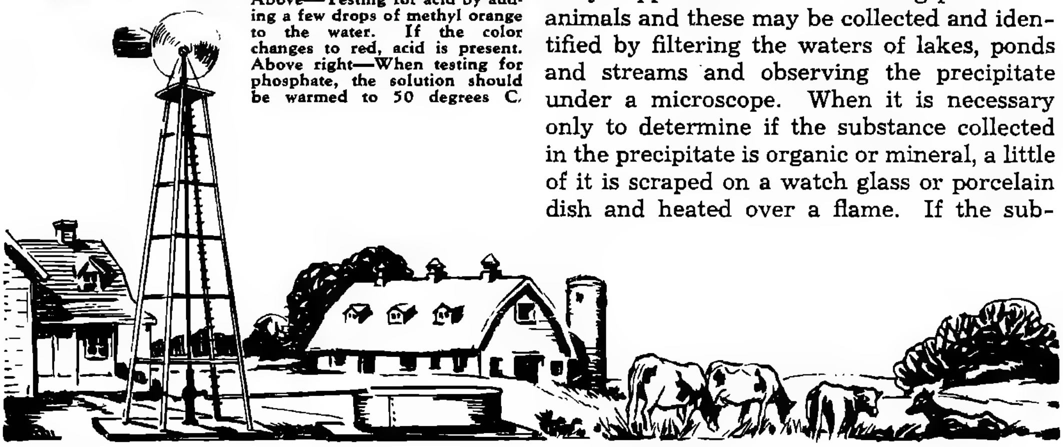
Above—Testing for acid by adding a few drops of methyl orange to the water. If the color changes to red, acid is present. Above right—When testing for phosphate, the solution should be warmed to 50 degrees C.



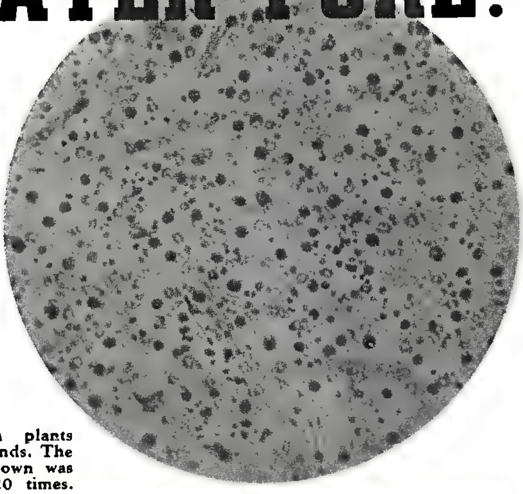
A micro-organism known as a desmid. This differs from a diatom in that it lacks a siliceous skeleton.

ONLY a very small fraction of the water found on the earth is fit for human consumption. Although three-quarters of the earth is covered to an average depth of one mile, pure water is never found. Impurities may be present even in distilled water if it is made at home. This is especially true if large amounts of ammonia are present. This volatile substance comes over first, the later distillate is pure.

Three general types of impurities are usually found in all water, although to a lesser degree in water piped into our homes. These are organic matter, mineral matter and gases. Natural waters as a rule are abundantly supplied with minute living plants and animals and these may be collected and identified by filtering the waters of lakes, ponds and streams and observing the precipitate under a microscope. When it is necessary only to determine if the substance collected in the precipitate is organic or mineral, a little of it is scraped on a watch glass or porcelain dish and heated over a flame. If the sub-



DRINKING WATER PURE?



Tiny green plants found in ponds. The specimen shown was enlarged 320 times.

stance chars, it is organic, the material remaining behind is inorganic. Organic material is absent from distilled water.

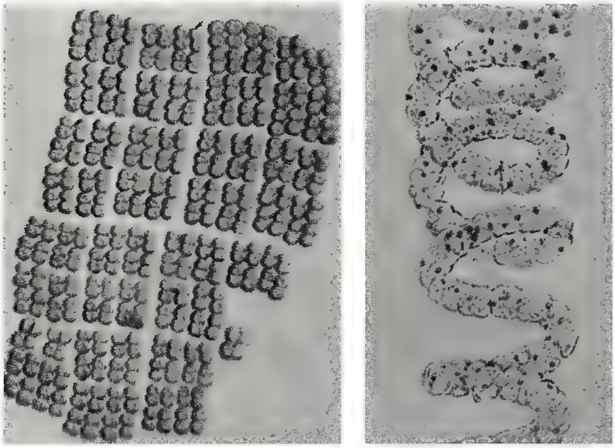
Ammonia should never be present in drinking water. If present it shows that the water is being contaminated. It is fairly easy to test for this substance by a very delicate reagent. Three parts of ammonia can be detected in ten million parts of water. Another element that should be absent is phosphates, especially in larger amounts. If present it is probable that the water is contaminated with sewage. The same is true if sodium chloride (common table salt) and sulphate of lime are present. The slightest quantity of nitrous acid makes the water dangerous for drinking purposes. All of these chemicals can be easily detected.

The presence of such salts as sodium carbonate, magnesium sulphate, etc., give us famous waters noted for their health giving properties.

The chlorides of lime and magnesium are important for they are responsible for the hardness of water. The former produces temporary hardness, the hardness of the water being removed by prolonged boiling. The latter gives permanent hardness. Such hard water is injurious because it impedes digestion. With the following directions such injurious salts as phosphates, chlorides, ammonia and nitrous acid can be detected.

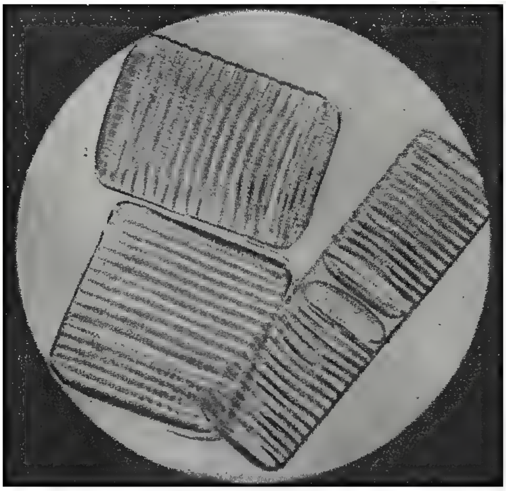
To test well or spring water, collect about one quart and let stand for about 24 hours. Then carefully pour off almost

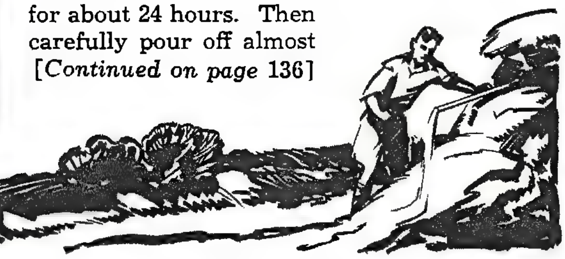
[*Continued on page* 136]

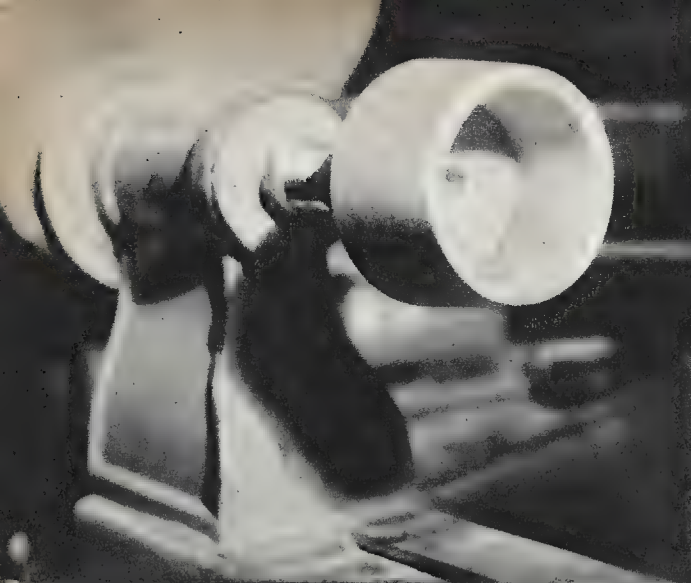


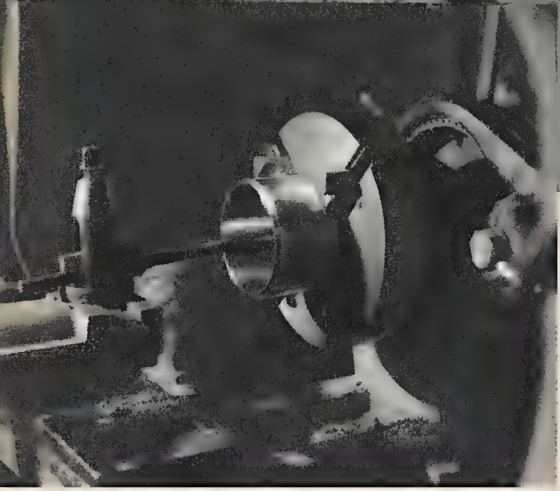
Examples of blue green algae. These have been magnified 600 times to make them easily visible. These are examples of the growths which may be found in some water.

Below—A diatom. Note the difference between this and the desmid on the opposite page. After death of a diatom, the skeleton becomes what is known as kieselguhr.









The process of creating the attractive and useful metal box and lid starts with the turning of patterns from close-grained wood such as gum or white pine, as shown in photos above. The patterns must be made oversize to allow for machining of the metal surfaces in the lathe. Left—Turning the metal box. Brass strips under each chuck jaw prevent marring of metal.

A Bronze

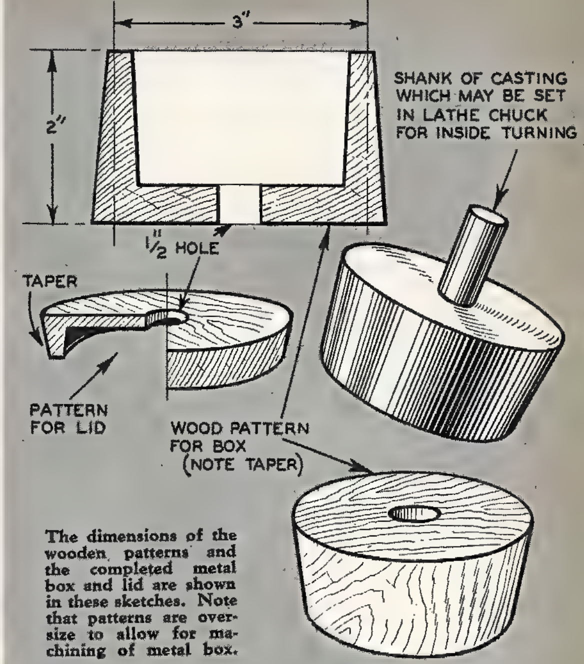
As YOU add machines to your shop its flexibility and scope of operation increases. The acquisition of a metal-turning lathe and blast furnace will permit you to easily cast and turn various attractive and useful projects in metal.

Herewith is shown and briefly described the casting and finishing of a small aluminum bronze—that lovely, non-tarnishing gold-colored metal—box with lid. The process consists of turning of patterns of wood, the casting of the metal in duplicate and the turning of these castings to give the result in the photo of the finished job. It will require several hours from start to finish but the box will, even with a gas-pitted blemish or two, be a fine addition to the mantel, smoking stand or wall shelf. Moreover, it's a permanent affair.

Assuming that your blast furnace has up to about six cubic inches capacity, we will make a box three inches in diameter and a shade more than two inches high. Turn the patterns from a close-grained wood such as gum or white pine. For the box pattern turn the piece oversize and taper the sides, both from the outside and inside, from the bottom toward the top. This facilitates removal of the pattern after packing in the mold. Make the box pattern two inches high, sand smooth and bore a half inch hole exactly through the center. In like manner turn the pattern for the lid, providing it with tapered side walls and a half-inch hole through the center. In each case the wood pattern should have greater diameter, height and thickness than the finished box will have so that all surfaces can be machined smooth in the metal lathe.

A half-inch rod is inserted in the center hole of the box pattern and graphite dusted well over it. To make a smoother job, hot paraffin can be brushed onto the wood and the surplus rubbed off while still in the lathe. This is set in the lower half of the flask with the inside packed tightly with the molding sand. To insure having the pattern lift out smoothly, reinforce this core with some pieces of wire or strips of quarter-inch mesh wire. The sand must not be too wet, otherwise surplus steam may pit the casting. Finish the

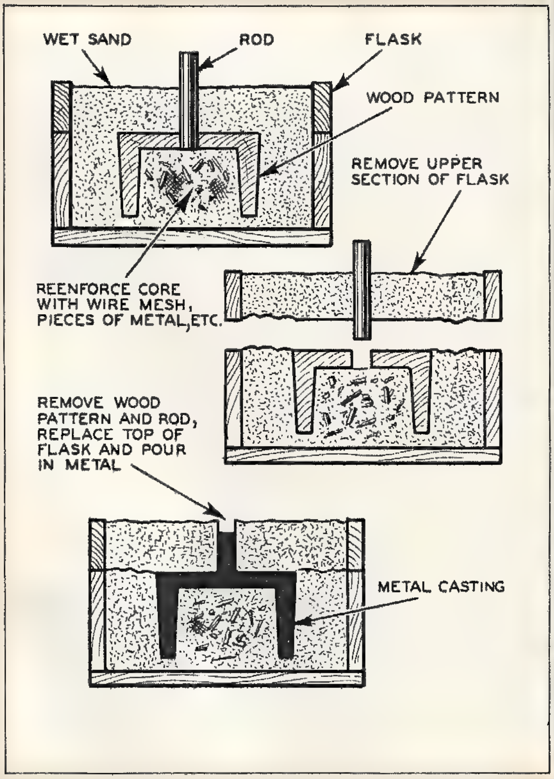
[*Continued on page* 140]


3"
2"
SHANK OF CASTING WHICH MAY BE SET IN LATHE CHUCK FOR INSIDE TURNING
1/2" HOLE
TAPER
PATTERN FOR LID
WOOD PATTERN FOR BOX (NOTE TAPER)

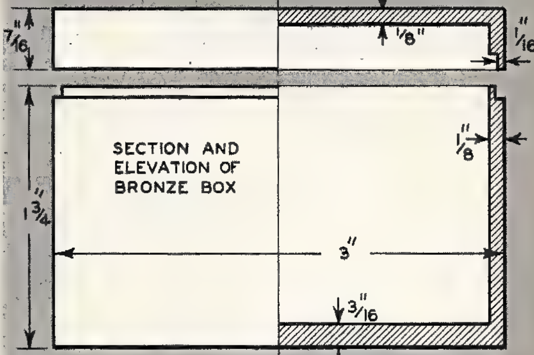
The dimensions of the wooden patterns and the completed metal box and lid are shown in these sketches. Note that patterns are oversize to allow for machining of metal box.

Box And Lid

by
DALE R. VAN HORN

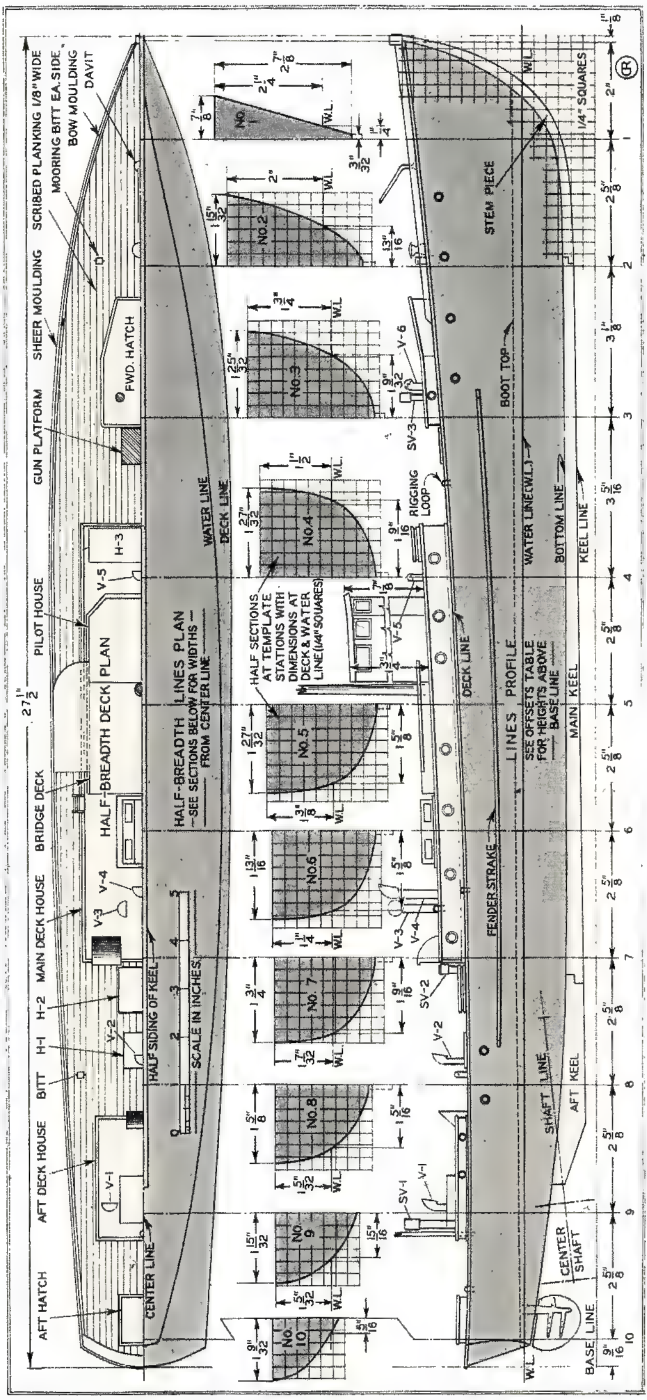

WET SAND
ROD
FLASK
WOOD PATTERN
REMOVE UPPER SECTION OF FLASK
REENFORCE CORE WITH WIRE MESH, PIECES OF METAL, ETC.
REMOVE WOOD PATTERN AND ROD, REPLACE TOP OF FLASK AND POUR IN METAL
METAL CASTING

The method of using the wooden patterns in preparing the wet sand mold for casting the metal box is shown in sketches above. Top photo—The completed box.


7/16"
1/8"
1/16"
SECTION AND ELEVATION OF BRONZE BOX
1 3/4"
1/8"
3"
3/16"

Below—Turning the metal lid. The protruding rod, which serves to hold the piece in lathe chuck while turning inside, is cut off later.

BUILD THIS U. S. COAST GUARD


SCRIBED PLANKING 1/8" WIDE
MOORING BITT EA. SIDE
BOW MOULDING
DAVIT
SHEER MOULDING
FWD. HATCH
GUN PLATFORM
H-3
V-5
PILOT HOUSE
PLAN
HALF-BREADTH DECK
27½"
BRIDGE DECK
V-4
V-3
MAIN DECK HOUSE
H-2
V-2
H-1
BITT
AFT DECK HOUSE
V-1
AFT HATCH
CENTER LINE
HALF-BREADTH LINES PLAN
—SEE SECTIONS BELOW FOR WIDTHS— FROM CENTER LINE
WATER LINE
DECK LINE
HALF SIDING OF KEEL
SCALE IN INCHES
HALF SECTIONS AT TEMPLATE STATIONS WITH DIMENSIONS AT DECK & WATER LINE (1/4" SQUARES)
NO. 1
NO. 2
NO. 3
NO. 4
NO. 5
NO. 6
NO. 7
NO. 8
NO. 9
NO. 10
W.L.
V-6
SV-3
RIGGING LOOP
SV-2
SV-1
STEM PIECE
BOOT TOP
DECK LINE
FENDER STRAKE
LINES PROFILE
SEE OFFSETS TABLE FOR HEIGHTS ABOVE BASE LINE
WATER LINE (W.L.)
BOTTOM LINE
KEEL LINE
MAIN KEEL
SHAFT LINE
AFT KEEL
CENTER SHAFT
BASE LINE
1/4" SQUARES
®

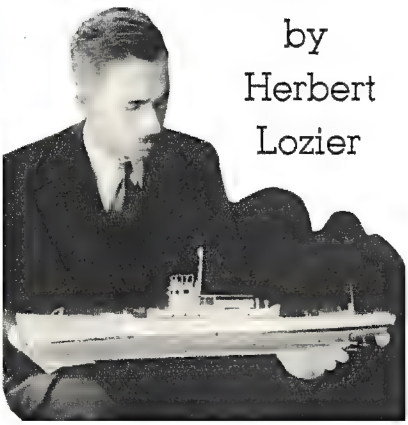
A template of each station given should be cut out before any attempt is made to shape the hull. If the hull is made up of two lifts, the division should be at the water line. The most satisfactory wood for hull will be straight grained, well dried white pine.

DURING the World War a large number of vessels were built to protect shipping against submarine warfare. Some of these ships were known as 110-foot sub-chasers. Powered by three 525 horsepower engines, they had a speed of approximately 15 knots. After the war, many of them were sold to private individuals, used for naval training purposes, or turned over to the Coast Guard for patrol purposes. The model presented is typical of this type, and was copied from the U. S. Coast Guard Patrol Cutter *Smith.*

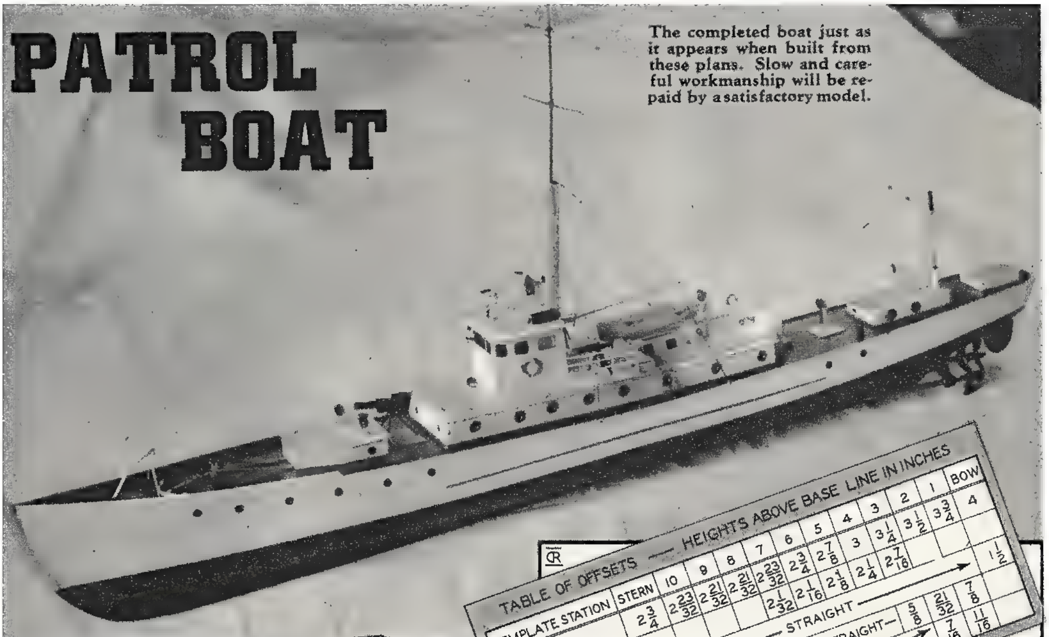
Built to a scale of ¼" to a foot, the model is 27½" long, 3¾" wide, and $3\frac{13}{16}$" deep at the bow. The hull can be built up in any of three ways, from a solid block; bread-and-butter fashion—that is, one lift on another, or using ribs and planking. However, the latter method is difficult and should be attempted only by persons experienced in the art of ship modeling.

If a solid block is used, obtain a straight grained, well dried piece of pine measuring 4"x4"x30". If lifts are used, each lift should measure not less than 3¾" wide, ¾" thick and 30" long. Four lifts of this size are required to give the hull the correct height. The simplest method for the average

by
Herbert
Lozier



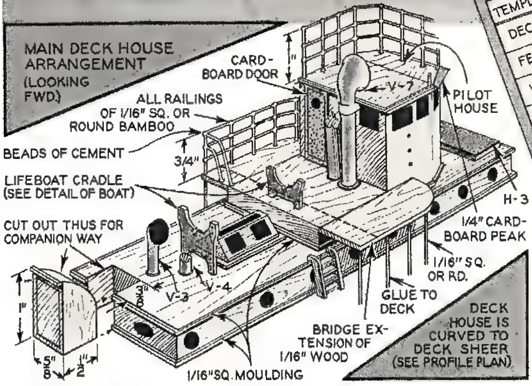
PATROL BOAT



The completed boat just as it appears when built from these plans. Slow and careful workmanship will be repaid by a satisfactory model.

TABLE OF OFFSETS — HEIGHTS ABOVE BASE LINE IN INCHES

TEMPLATE STATION	STERN	10	9	8	7	6	5	4	3	2	1	BOW
DECK LINE	2 3/4	2 23/32	2 21/32	2 21/32	2 23/32	2 3/4	2 7/8	3	3 1/4	3 1/2	3 3/4	4
FENDER STRAKE					2 1/32	2 1/16	2 1/8	2 1/4	2 7/16			
WATER LINE	1 1/2	←				STRAIGHT					→	1 1/2
BOTTOM LINE		1 11/32	31/32	23/32	5/8	—	STRAIGHT	—	5/8	21/32	7/8	
KEEL LINE				1/4	←		SLOPE		→	7/16	11/16	

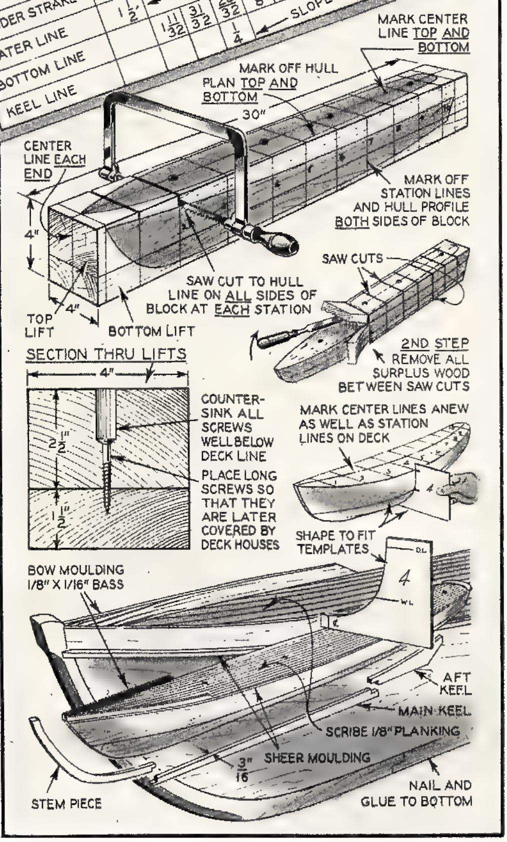


MAIN DECK HOUSE ARRANGEMENT (LOOKING FWD.)
CARD-BOARD DOOR
1"
V-7
PILOT HOUSE
ALL RAILINGS OF 1/16" SQ. OR ROUND BAMBOO
BEADS OF CEMENT
3/4"
LIFEBOAT CRADLE (SEE DETAIL OF BOAT)
H-3
CUT OUT THUS FOR COMPANION WAY
1/4" CARD-BOARD PEAK
1/16" SQ. OR RD.
1"
3/8"
V-3
V-4
GLUE TO DECK
DECK HOUSE IS CURVED TO DECK SHEER (SEE PROFILE PLAN)
BRIDGE EXTENSION OF 1/16" WOOD
5/8"
1/2"
1/16" SQ. MOULDING

builder is the use of two lifts, as shown in the drawings.

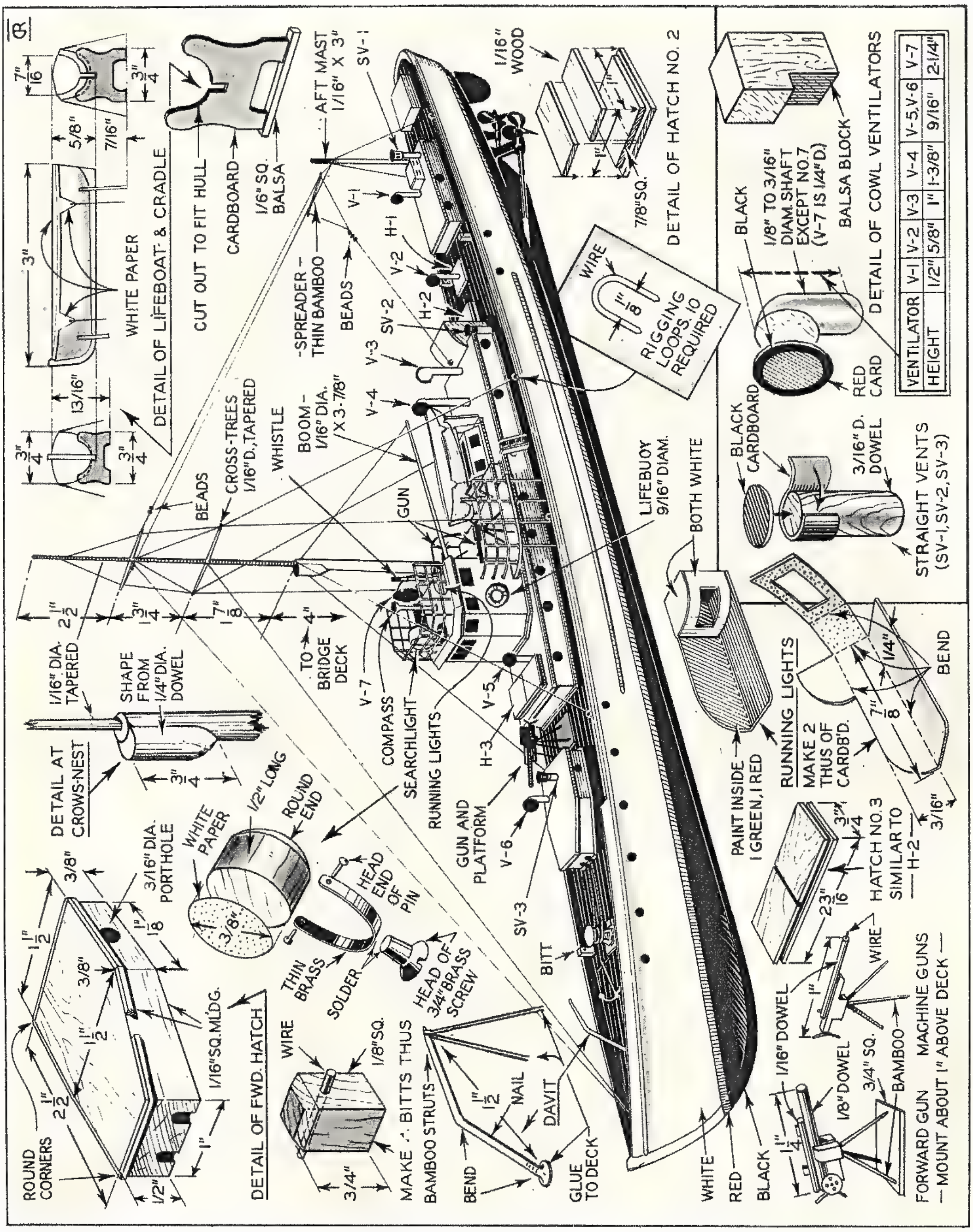
After the two pieces are fastened together, the saw cuts are made as shown in the drawing. A series of templates are made of cardboard, cut from deck to centerline with the water line marked on each. These are numbered to correspond with lines drawn across the hull. These templates should be cut with great care to insure even hull lines. A round stick about 15″ long should be screwed to the deck, the screw holes being positioned so that they will be covered by the deck house. This enables the builder to tilt the hull to any desired angle in a vise while shaping it.

When cutting the hull to the templates, do not cut it exactly to any one template; work with several at a time, and when the hull is roughed to shape, trim it down smoothly with a plane and sandpaper. Then remove



MARK CENTER LINE TOP AND BOTTOM
MARK OFF HULL PLAN TOP AND BOTTOM
30"
CENTER LINE EACH END
4"
MARK OFF STATION LINES AND HULL PROFILE BOTH SIDES OF BLOCK
SAW CUTS
SAW CUT TO HULL LINE ON ALL SIDES OF BLOCK AT EACH STATION
4"
TOP LIFT
BOTTOM LIFT
2ND STEP
REMOVE ALL SURPLUS WOOD BETWEEN SAW CUTS
SECTION THRU LIFTS
4"
2 1/2"
1 1/2"
COUNTER-SINK ALL SCREWS WELL BELOW DECK LINE
PLACE LONG SCREWS SO THAT THEY ARE LATER COVERED BY DECK HOUSES
MARK CENTER LINES ANEW AS WELL AS STATION LINES ON DECK
SHAPE TO FIT TEMPLATES
4
D.L.
W.L.
BOW MOULDING 1/8" X 1/16" BASS
AFT KEEL
MAIN KEEL
SCRIBE 1/8" PLANKING
SHEER MOULDING
3/16"
STEM PIECE
NAIL AND GLUE TO BOTTOM

Above is shown the method of carving the hull. After the lifts are screwed together, they should be marked carefully for each saw cut. At the left is shown details for the deck house construction. This should be curved to the deck sheer.



DETAIL OF LIFEBOAT & CRADLE
7/16"
5/8"
7/16"
3/4"
3"
13/16"
3/4"
3/4"
WHITE PAPER
CUT OUT TO FIT HULL
CARDBOARD
1/6" SQ. BALSA
AFT MAST 1/16" X 3"
SV-1
V-1
H-1
V-2
H-2
SV-2
V-3
V-4
-SPREADER - THIN BAMBOO
BEADS
BOOM - 1/16" DIA. X 3-7/8"
WHISTLE
CROSS-TREES 1/16" D. TAPERED
BEADS
GUN
1 1/2"
1 3/4"
1 7/8"
4"
TO BRIDGE DECK
1/16" DIA. TAPERED
SHAPE FROM 1/4" DIA. DOWEL
DETAIL AT CROWS-NEST
3/4"
V-7
COMPASS
SEARCHLIGHT
RUNNING LIGHTS
V-5
H-3
GUN AND PLATFORM
V-6
SV-3
BIT
WHITE PAPER
1/2" LONG
ROUND END
3/16" DIA. PORTHOLE
3/8"
HEAD END OF PIN
THIN BRASS
SOLDER
HEAD OF 3/4" BRASS SCREW
3/8"
1 1/2"
3/8"
1/8"
1 1/2"
2 1/2"
1/16" SQ. MLDG.
1"
1/2"
ROUND CORNERS
DETAIL OF FWD. HATCH
WIRE
1/8" SQ.
3/4"
MAKE 4 BITTS THUS
BAMBOO STRUTS
1 1/2"
NAIL
DAVIT
BEND
GLUE TO DECK
1/16" WOOD
1"
1"
7/8" SQ.
DETAIL OF HATCH NO. 2
WIRE
1/8"
RIGGING LOOPS, 10 REQUIRED
LIFEBUOY 9/16" DIAM.
BOTH WHITE
WHITE
RED
BLACK
BLACK
1/8" TO 3/16" DIAM. SHAFT EXCEPT NO. 7 (V-7 IS 1/4" D.)
BALSA BLOCK
RED CARD
BLACK CARDBOARD
DETAIL OF COWL VENTILATORS
3/16" D. DOWEL
STRAIGHT VENTS (SV-1, SV-2, SV-3)
1/4"
BEND
7/8"
3/16"
RUNNING LIGHTS
MAKE 2 THUS OF CARDB'D.
PAINT INSIDE 1 GREEN, 1 RED
3/4"
2 3/16"
HATCH NO. 3 SIMILAR TO H-2
WIRE
1"
1/16" DOWEL
1/8" DOWEL
3/4" SQ.
BAMBOO
1 1/4"
FORWARD GUN MACHINE GUNS
— MOUNT ABOUT 1" ABOVE DECK —

VENTILATOR	V-1	V-2	V-3	V-4	V-5, V-6	V-7
HEIGHT	1/2"	5/8"	1"	1-3/8"	9/16"	2-1/4"

The general arrangements and details of the principal fittings are shown above. Windows and ports are made from scraps of black paper pasted in place after the painting is completed. If preferred, many of these fittings can be purchased ready made.

the round stick and fasten it to the bottom of the hull on the center line. Work then can be done on the deck line without danger of damaging the hull sides. Trim the deckline carefully with a plane, just short of the desired height, and finish with sandpaper.

Remove the round stick and add the keel. It is shaped from a length of pine, $\frac{3}{16}''$ thick and 15″ long. The keel is joined to the bow and stern pieces. The stem piece and aft keel should be fastened in place temporarily. Then

[*Continued on page* 136]

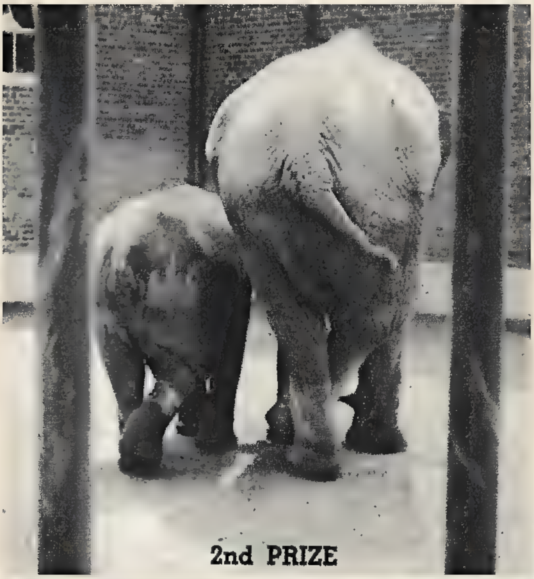
MECHANIX ILLUSTRATED PHOTOGRAPHY SECTION

PAGES 119-132

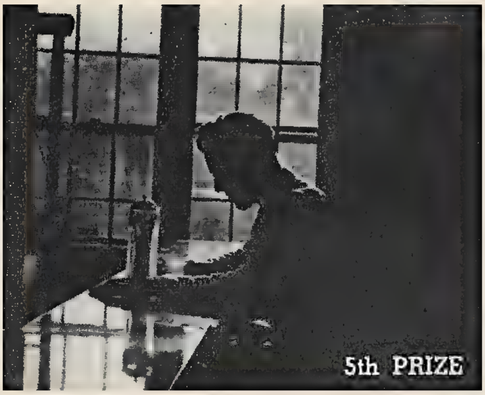
1st PRIZE

3rd PRIZE

4th PRIZE


2nd PRIZE

FIRST PRIZE: "Mess Call," by Marcella A. Schmitz, Minneapolis, Minn. Kodak camera with Verichrome film developed in D-72; taken at f.4.5 and 1/25 sec. SECOND PRIZE: "Me and Mom," by Rudolph Bogar, Brooklyn, N. Y. Taken with Super Ikonta B on S. S. Pan film at f.16 and 1/50 sec. THIRD PRIZE: "FLIGHT," by H. F. Graves, Brantingham, N. Y. Taken with Zeca Bettax on S. S. Pan film at f.8 and 1/250 sec. FOURTH PRIZE: "Cut Glass," by Henry J. Suliss, Belleville, N. J. Taken with a 4x5 plate camera at f.32 and 30 minutes using an ordinary two-cell flashlight. FIFTH PRIZE: "SILHOUETTE," by W. Reedy, Wilkes Barre, Pa. Taken at f.5.6 and 1/25 sec. against natural light.


5th PRIZE

MONEY FOR YOUR PICTURES

Get busy with your camera and send in unusual pictures of people, animals, machines, trains, airplanes, etc. Each month we will pay $15 for the best picture received from readers, $10 for the second choice, and $5 each for the next three selections. Prints should be glossy, as large as possible up to 8x10 inches (although a small, clear photo is more desirable than a big fuzzy one) and should be accompanied by the following data: make and size of camera, type of film, and how developed and printed, lens opening and shutter speed, and lighting conditions. Wrap all prints carefully, put your name and address on the back of each, and include postage if you want them returned. Address all contributions to Photography Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

To avoid false readings caused by the strong light of the sky, hold the meter close to the subject.

GETTING THE MOST FROM YOUR EXPOSURE

by Herbert C. McKay

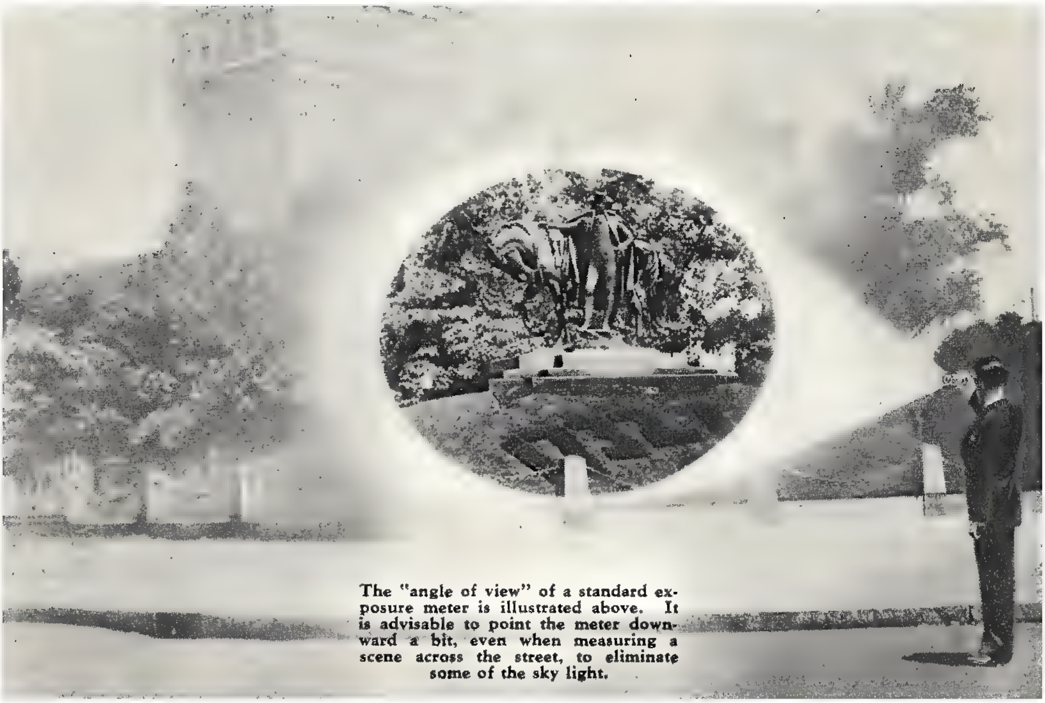
EXPOSURE meters are divided into two classes, the photo-electric type and the visual extinction type. Both are good, and when properly used, both are dependable guides to correct exposure.

What constitutes correct photographic exposure? The laboratory worker will tell you that the correct exposure is one which results in a photographic image whose various degrees of density correspond to the intensities of light reflected from the image. This is perfectly true from a technical point of view, but in very many cases it is far from the truth in practical photography. Photography is no longer a method of mechanically recording an image in front of a camera; it is a medium through which we may convey a definite idea. Very often it is essential to this result that the exposure be deliberately less or greater than the theoretical normal. The exposure meter can tell you just how much above or below normal the exposure should be in order to obtain the effects you desire.

For example, if you have a subject in which the hands and face stand out strongly against a black background, a background with which the black costume of the subject merges almost imperceptibly, the exposure meter will indicate the *various* exposures which will record the hands and the face and it will also give you the maximum exposure which can be used without recording the dark background. Such meter readings are called differential readings.

Likewise, when photographing a landscape in which some object in the near foreground is used for decorative purposes, the proper use of the exposure meter will enable you to give an exposure which will produce good results in the landscape and also give you the exposures desired for the foreground. You may throw the foreground into black silhouette or you may give it almost any degree of detail you desire.

It is obvious from these statements that the exposure meter cannot successfully be used



The "angle of view" of a standard exposure meter is illustrated above. It is advisable to point the meter downward a bit, even when measuring a scene across the street, to eliminate some of the sky light.

METER

from the position of the camera. It is a fundamental of exposure practice to make the meter reading at a distance from the object which is not greater than the width of that object. If you are making a reading of the face of a human subject, the meter should be not more than ten or at most twelve inches away. If the subject is a group and you are interested in costume as well as in faces then you make your reading at a distance of four or five feet. If the subject is architectural and forty or fifty feet wide, you can make your reading from across the street.

As a rule, if you will spread the index and second finger as widely as you can, this will give you an approximate angle of reading of the meter.

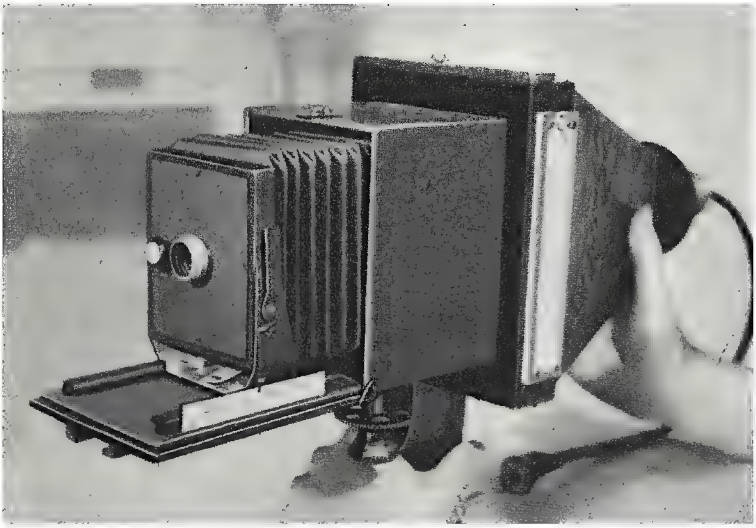
Obviously, if you have a model in a light costume posed against a black background, and you are far enough away to get a full figure, a meter reading from the camera position would be largely a reading of the black background and the result would be a badly over-exposed image of the model.

In tropical countries and even in the temperate zones in the bright sunlight of summer, a general reading from the camera position will usually result in a very hard negative and in shadows which are almost jet black. If you are going to make a photograph of a girl wearing a hat which shades her face, take the meter right up to her, make the reading on the shaded part of the face and give that exposure. Tests have shown that in actual practice you can get a usable negative when the exposure is as little as one-tenth of the normal, while it will not injure the printing qualities of the negatives if the exposure is considerable above normal on the other side.

Several photo-electric type meters are particularly well adapted to differential reading because two "extreme" arrows on the dial indicate the average latitude of film. If you read the deepest shadow and the brightest highlight and then set the two arrows of the dial as nearly as possible to these two readings, the central indicator will show the proper exposures to get this range. If the two extreme readings lie within these two outside arrows, you will get a good reproduction of all objects in the scene, but they

[*Continued on page* 139]

THE "AUTOSET"



by C. C. Beck

It has a set focus calibrated to predetermined enlargement sizes for negatives up to 4x5.

THIS enlarger, while built along conventional lines, possesses several features which make it an outstanding piece of home-built equipment. Chief of these is the slide rule focusing arrangement which makes it possible to set the enlarger exactly to the size enlargement required, in a matter of seconds, bringing it automatically into perfect focus at the same time. This is an enormous improvement over most enlargers which take several minutes of juggling back and forth with the lens wide open to secure enough light and then stopping down to the required opening, before the print can be made. Using the slide rule scales, the light need be switched on only for the actual projection; focusing is done by whatever illumination you have in your dark room.

As designed and built, the enlarger can be folded up and then taken apart for storing or carrying in a suitcase. If this feature is not desired, the construction can be simplified considerably and several parts eliminated without the least loss of efficiency in the finished job. Should the focusing and ventilating systems prove too complicated as shown, these can also be handled more simply.

A 100-watt bulb in the tin reflector gives ample illumination in actual use, with printing time ranging from fifteen to sixty seconds. The reflector is cut from sheet tin to the pattern shown in Fig. 3, bent up, and soldered down the open side. It is capped with a sec-

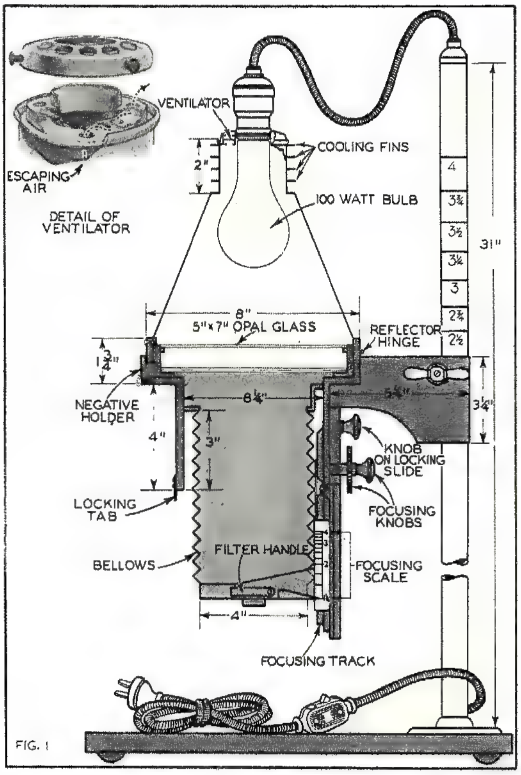
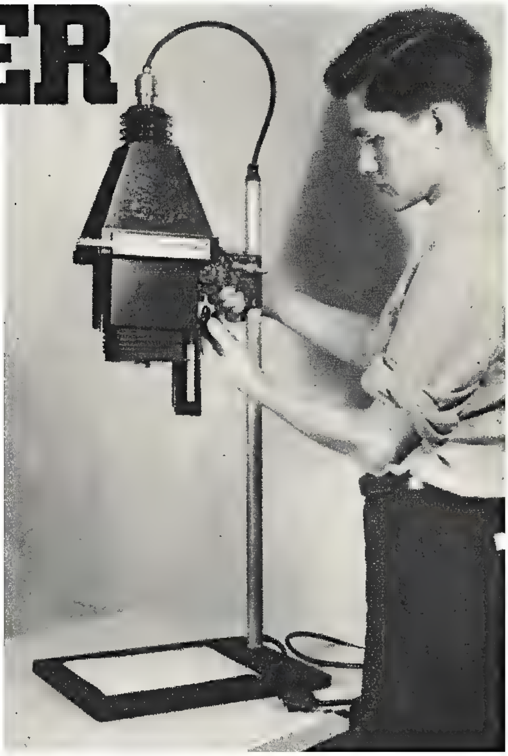

VENTILATOR
COOLING FINS
ESCAPING AIR
2"
DETAIL OF VENTILATOR
100 WATT BULB
4
3¾
3½
3¼
3
2¾
2½
31"
8"
5"x7" OPAL GLASS
REFLECTOR HINGE
1¾"
NEGATIVE HOLDER
8¼"
5¼"
3¼"
4"
3"
KNOB ON LOCKING SLIDE
LOCKING TAB
FOCUSING KNOBS
FILTER HANDLE
BELLOWS
FOCUSING SCALE
4"
FOCUSING TRACK

FIG. 1

Top—focusing end of the enlarger showing bellows, focusing knob, lens board and supports, and track. Knob left of lens opening controls diaphragm stops. Above—Details of enlarger with bellows extended.

ENLARGER

tion of a tin can which carries the ventilator and the cooling fins as shown in Fig. 1. Construction of these calls for some rather neat soldering but should not prove beyond the ability of a good home workman. Saw off two inches of a tin can 2½ inches in diameter and cut a hole 1⅜ inches in diameter in its top. Around this hole drill or punch four small holes at equal intervals. Solder a tin collar ½ inch high around the center hole, and another collar $\frac{5}{16}$ inch high and 2¼ inches in diameter around this. Now cut two tin washers exactly to fit the space between and in each punch four holes. Solder these into position with the holes staggered and you have a compact and efficient light trap which will keep your reflector from sweating up inside and prolong the life of your bulb. The middle washer, you will notice, is held in position before soldering by two ⅛-inch strips dropped in beneath it. Over the whole thing goes a threaded lamp-shade holder from the dime store. This is held both by its own screws and by soldering to the can and to the inner collar. Now slip the four cooling rings up and solder them fast and you can solder the whole unit to the square top of the reflector and this in turn to the reflector itself.



Above—Completed enlarger in operation. Below—Details of focusing mechanism optional with builder.

From plywood build a shallow topless box 8x5¾x1¾ inches with a square hole 5¼x3¾ inches in its bottom. Leave a space ½ inch high at the front for the negative holder to slide in, and glue a strip of ⅛-inch balsa or cigar box wood ¾ inch wide inside each side ½ inch up from the bottom. At front and back glue ¼-inch strips of the same width. Then glue a ⅛-inch square strip all the way around inside and your 5x7-inch opal glass should drop right in, to be held in place with a small brad or two. The remaining ¼ inch at the top is for the reflector to fit into, and you can glue a narrow strip of black velvet around the inside of the box to insure a light-tight fit against the sides of the reflector.

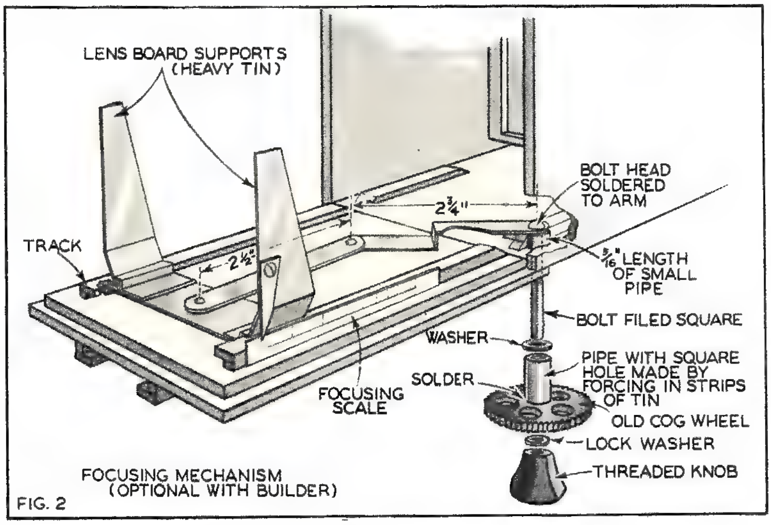
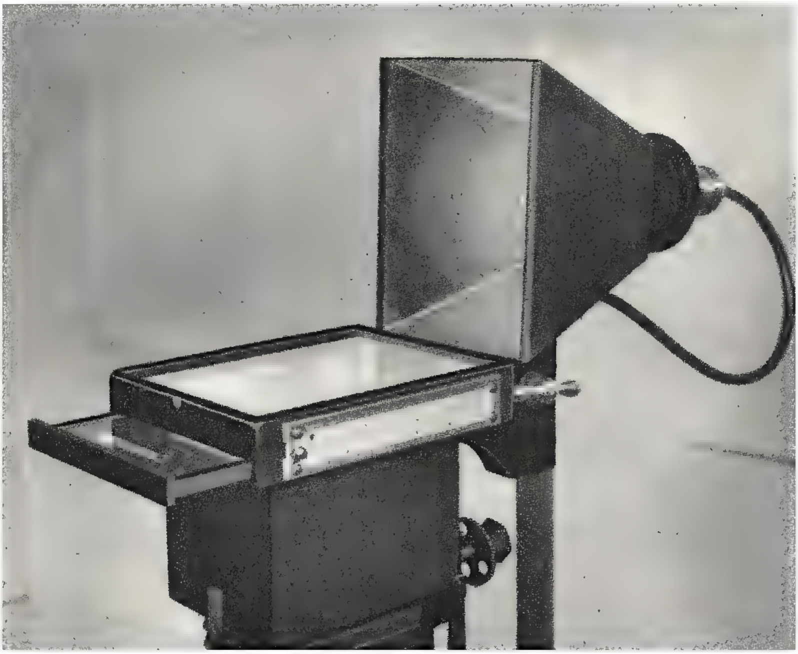

LENS BOARD SUPPORTS (HEAVY TIN)
TRACK
2½"
2¾"
BOLT HEAD SOLDERED TO ARM
5/16" LENGTH OF SMALL PIPE
BOLT FILED SQUARE
WASHER
SOLDER
PIPE WITH SQUARE HOLE MADE BY FORCING IN STRIPS OF TIN
OLD COG WHEEL
LOCK WASHER
THREADED KNOB
FOCUSING SCALE
FOCUSING MECHANISM (OPTIONAL WITH BUILDER)

FIG. 2

If you are not making a folding model, you can now proceed to build a plywood frame 5¾x4x4 inches deep except at the back, where it will be 9¼ inches deep. On this back build



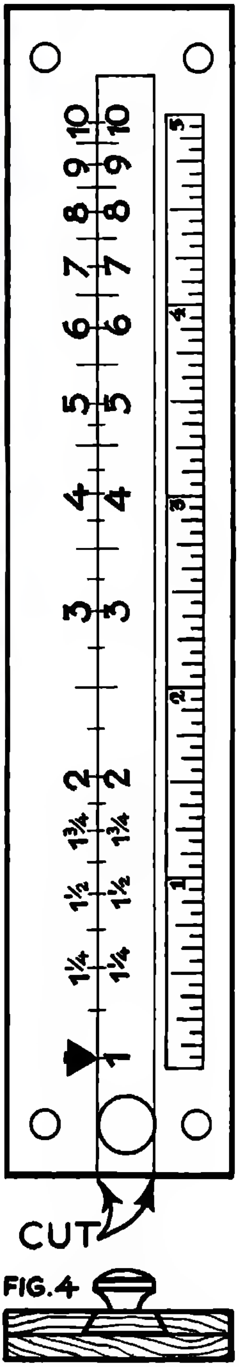

10
9
8
7
6
5
4
3
2
1¾
1½
1¼
1
5
4
3
2
1
CUT

FIG. 4

Above—Reflector folded back showing opal glass and negative holder partly pulled out. Right—This calibrated slide-rule indicates how to set the enlarger to bring any negative up to any required size.

up the tracks of ⅛-inch material. Space them 2½ inches apart and build a wood or metal board 1¼x2½ inches to slide between them. Onto this is bolted or screwed the two lens board supports. You can work out some arrangement to lock the whole thing at any position if you do not make the focusing device shown in Fig. 2. The one shown takes a little more time and will have to be quite carefully fitted together but works very well and adds to the professional appearance and operation of the enlarger when completed.

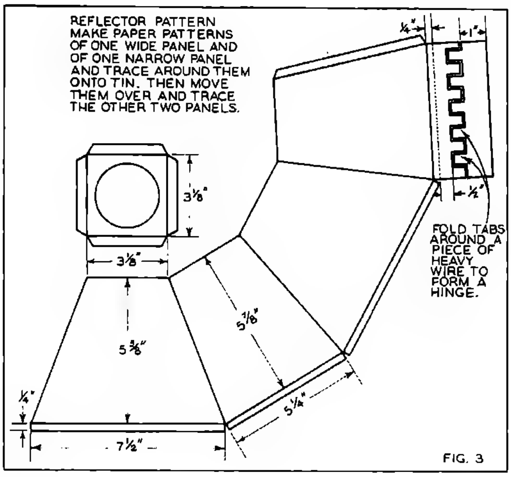

REFLECTOR PATTERN
MAKE PAPER PATTERNS OF ONE WIDE PANEL AND OF ONE NARROW PANEL AND TRACE AROUND THEM ONTO TIN. THEN MOVE THEM OVER AND TRACE THE OTHER TWO PANELS.
¼"
1"
½"
3⅛"
3⅛"
5⅜"
5⅛"
5¼"
¼"
7½"
FOLD TABS AROUND A PIECE OF HEAVY WIRE TO FORM A HINGE.

FIG. 3

The construction of the folding model can be worked out from the drawings and photos. The part that folds must, of course, fit exactly into the end of the box. It is hinged by two tin tabs or ears at the sides pivoting on small nails, and it is locked in position by another slide 5¾ inches long, which works in tracks similar to the ones used in the focusing bed. When shut, a projecting nail in the end of the slide fits into a corresponding hole in the little tab on the front of the enlarger. Also the focusing tracks will have to be cut at the folding line. You will notice from the plans, Fig. 1 and 2, that the bellows fits back inside the box against a frame glued inside the box 3 inches up from bottom edge. At the back this frame has a setback to accommodate the focusing arms in folded position.

Materials Used

1 pc. opal glass 5x7 in.
2 pc. clear glass 5x7 in.
1 pc. black rubberized focusing cloth 10x15⅞ in.
1 lens of 5 to 5½-inch focal length
1 pc. 5x7 in. ground glass

The above materials may be purchased in any camera supply house. Cost of the glass is very little. The focusing cloth is about 50 cents. A suitable lens may be bought for $8 to $12.

1 lamp socket
1 threaded lamp shade holder
10 feet of lamp cord
2 small threaded knobs
1 switch
1 male plug
3 rubber feet

The above items may be purchased in dime or hardware stores.

31-inch length of 1-inch-outside-diameter pipe threaded at one end
1 pipe flange
1 pc. sheet roof tin
Scrap galvanized iron (16, 18 or 20 gauge)

The above materials may be purchased in hardware or plumbing shops. Other materials needed are plywood and balsa wood obtainable at lumber yards; scrap wood, an old faucet, a tin can obtainable from scrap yards.

You had best construct your own bellows, exactly as shown in Fig. 5, to insure a fit in the folding model with focusing knobs; otherwise a second-hand camera bellows of about 4 inches extension can be used. This can be fastened to a frame at the bottom of the box and not set back in at all. To build the bellows, tack a piece of black rubberized focusing cloth to a board, rubber side up, and with pencil lay out the lines shown in Fig. 5. Cut a number of ¼-inch strips of thin fibre or thin cardboard, and glue each one down with iron glue or other good adhesive. Give it a coat of flat black paint and fold it around and glue the ends together. It will fold up almost automatically when you glue the ends together, but you may have a little trouble get-

[*Continued on page* 138]

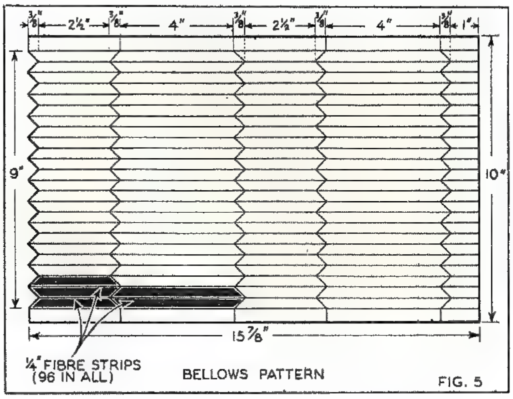

⅜"
2¼"
⅜"
4"
⅜"
2¼"
⅜"
4"
⅜"
1"
9"
10"
15⅞"
¼" FIBRE STRIPS (96 IN ALL)
BELLOWS PATTERN

FIG. 5

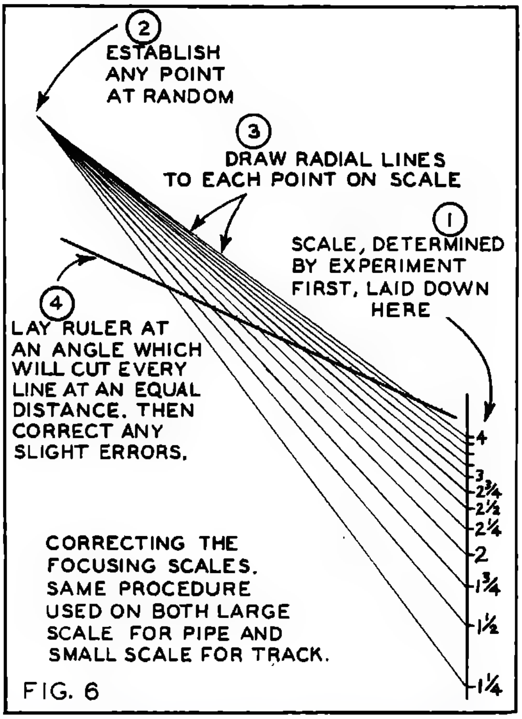
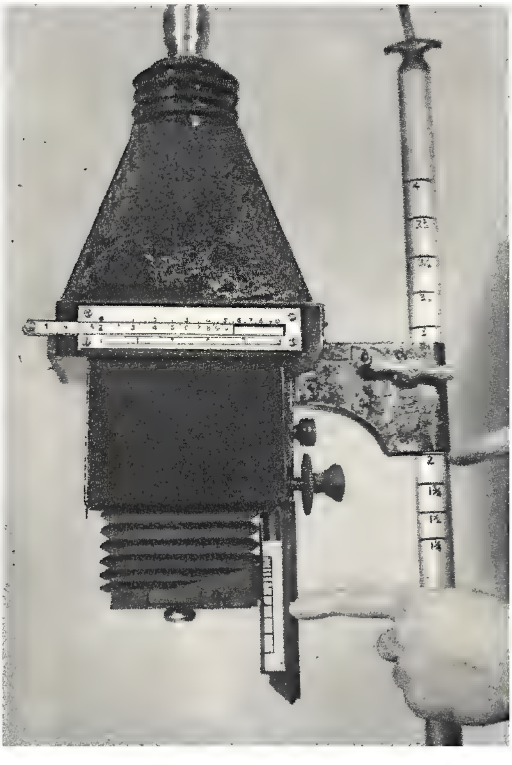
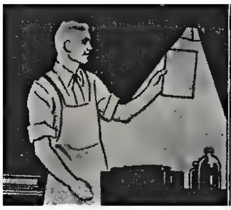

② ESTABLISH ANY POINT AT RANDOM
③ DRAW RADIAL LINES TO EACH POINT ON SCALE
① SCALE, DETERMINED BY EXPERIMENT FIRST, LAID DOWN HERE
④ LAY RULER AT AN ANGLE WHICH WILL CUT EVERY LINE AT AN EQUAL DISTANCE. THEN CORRECT ANY SLIGHT ERRORS.
4
3
2¾
2½
2¼
2
1¾
1½
1¼
CORRECTING THE FOCUSING SCALES. SAME PROCEDURE USED ON BOTH LARGE SCALE FOR PIPE AND SMALL SCALE FOR TRACK.

FIG. 6



Top—Showing method of correcting focusing scale. Above—Showing scale settings for a 2-time enlargement. Left—Details of bellows.



BUILT-IN DARKROOM

WHERE there is a spare room in the house devoted to general purposes such as sewing, home-work or drawing, this compact dark room can be built into a corner without seriously crowding other activities.

The floor-space of the original is only four by six feet, Fig. 1, and with screws into walls and floor placed judiciously, no damage is done that cannot be repaired with plastic cement in case you wish to take the partitions down later.

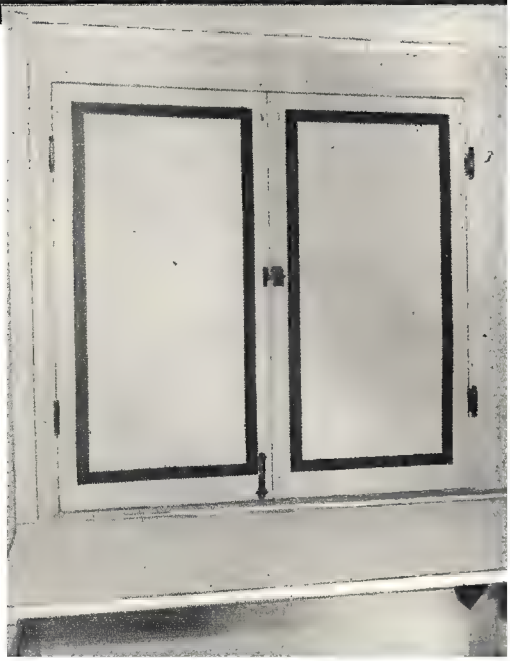
Framing throughout is two-by-two pine, Fig. 2, and where these join wall, floor and ceiling, countersunk flathead wood screws are used into studs and beams. In standard practice studs are spaced 16 inches on centers, beams usually closer together. To locate either, tap plaster lightly with a hammer until the sound indicates, not a hollow space beneath, but solid wood. Then drill through to confirm the location. By using screws instead of nails the framing is brought up snugly, closing cracks that might otherwise let light through. In case you are not able to shut out light entirely, caulk the seam either with candle wicking driven in with a screwdriver, or with putty.

Whatever alterations from the original floor plan you are required to make, bear in mind that plywood panels are 48 inches wide, and arrange your area, if possible, for cutting the plywood without waste.

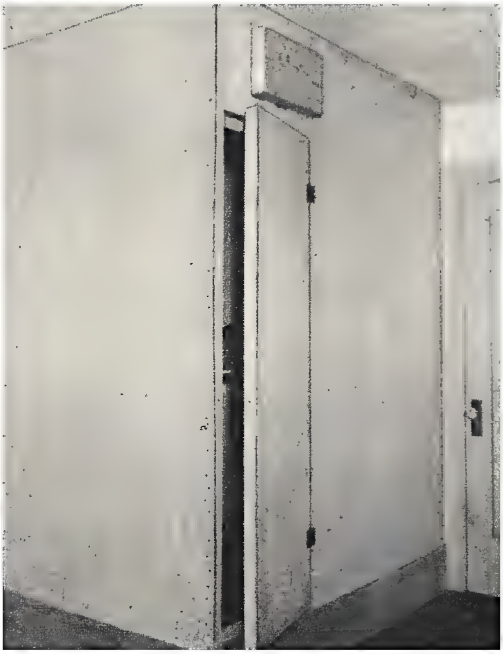
In the original it was necessary to fit around molding, baseboard and, on one side, a window sill. A board ¾ by 6 inches was trimmed to fit the obstructions and then nailed permanently to the plywood, as shown.

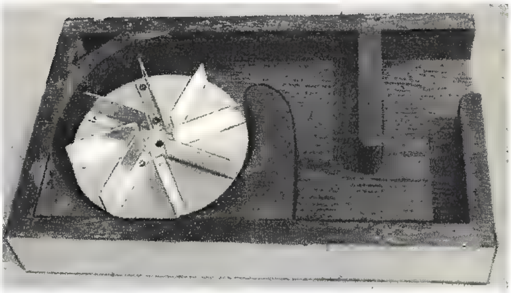
The door is simply a plywood panel on a two-by-two frame, closing against plywood strips shutting out the light, Fig. 3. A triangular wood gusset is placed back of the joint.

For a quiet, non-draft ventilation system designed to run continuously while the darkroom is occupied, a centrifugal type fan is mounted on a small motor, and installed above the door. The motor is inside the partition, the fan just outside, drawing air out through a 4-inch circular opening, Fig. 4.

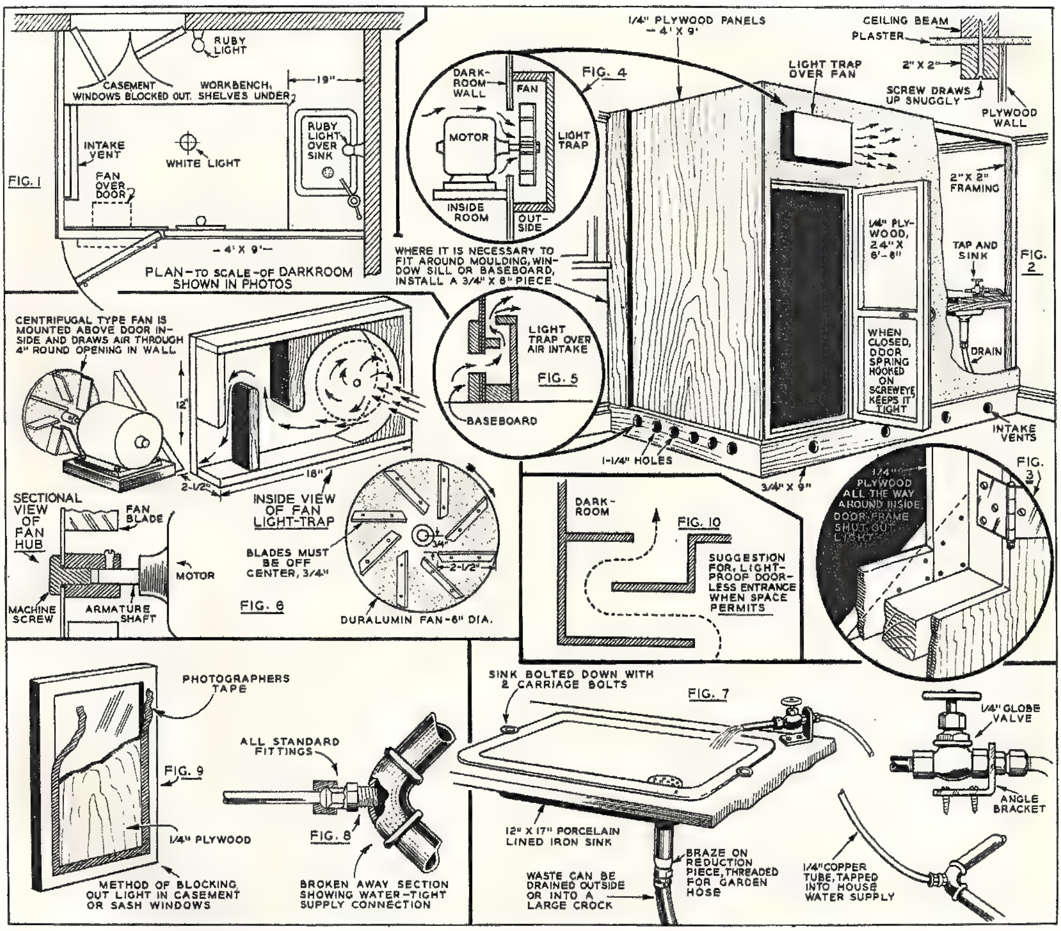


Above: Plywood panels cover window panes and are sealed with black Scotch tape around edges. Below: The completed plywood darkroom. Box over door is fan housing.





Above: Details of home-made centrifugal type ventilating fan. Left: Simple sink for washing purposes. Below: Complete construction plans of darkroom and its fittings.

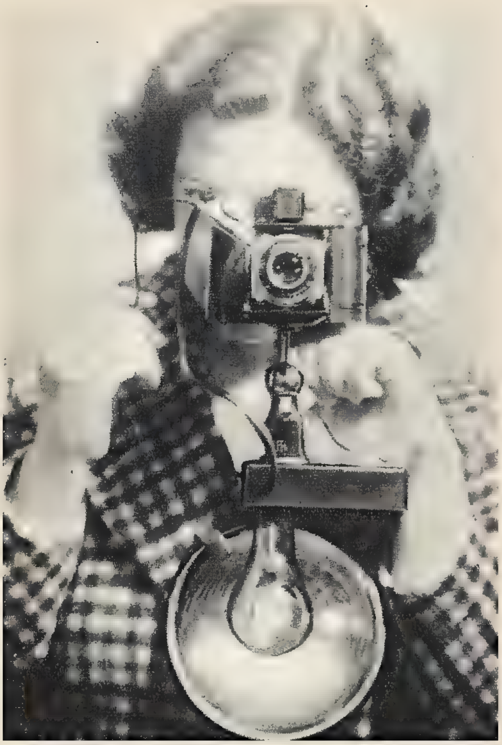

RUBY LIGHT
CASEMENT WINDOWS BLOCKED OUT.
WORKBENCH, SHELVES UNDER
19"
RUBY LIGHT OVER SINK
INTAKE VENT
WHITE LIGHT
FAN OVER DOOR
FIG. I
– 4' X 9' –
PLAN–TO SCALE–OF DARKROOM SHOWN IN PHOTOS
DARK-ROOM WALL
FAN
MOTOR
LIGHT TRAP
INSIDE ROOM
OUT-SIDE
FIG. 4
WHERE IT IS NECESSARY TO FIT AROUND MOULDING, WINDOW SILL OR BASEBOARD, INSTALL A 3/4" X 8" PIECE
LIGHT TRAP OVER AIR INTAKE
FIG. 5
BASEBOARD
1/4" PLYWOOD PANELS – 4' X 9'
LIGHT TRAP OVER FAN
CEILING BEAM
PLASTER
2" X 2"
SCREW DRAWS UP SNUGGLY
PLYWOOD WALL
2" X 2" FRAMING
1/4" PLYWOOD, 24" X 6'-8"
TAP AND SINK
FIG. 2
WHEN CLOSED, DOOR SPRING HOOKED ON SCREWEYE KEEPS IT TIGHT
DRAIN
INTAKE VENTS
1-1/4" HOLES
3/4" X 9"
CENTRIFUGAL TYPE FAN IS MOUNTED ABOVE DOOR INSIDE AND DRAWS AIR THROUGH 4" ROUND OPENING IN WALL
12"
18"
2-1/2"
INSIDE VIEW OF FAN LIGHT-TRAP
SECTIONAL VIEW OF FAN HUB
FAN BLADE
MOTOR
MACHINE SCREW
ARMATURE SHAFT
BLADES MUST BE OFF CENTER, 3/4"
3/4"
2-1/2"
FIG. 6
DURALUMIN FAN–6" DIA.
DARK-ROOM
FIG. 10
SUGGESTION FOR LIGHT-PROOF DOORLESS ENTRANCE WHEN SPACE PERMITS
1/4" PLYWOOD ALL THE WAY AROUND INSIDE DOOR FRAME SHUT OUT LIGHT
FIG. 3
PHOTOGRAPHERS TAPE
FIG. 9
1/4" PLYWOOD
METHOD OF BLOCKING OUT LIGHT IN CASEMENT OR SASH WINDOWS
ALL STANDARD FITTINGS
FIG. 8
BROKEN AWAY SECTION SHOWING WATER-TIGHT SUPPLY CONNECTION
SINK BOLTED DOWN WITH 2 CARRIAGE BOLTS
FIG. 7
1/4" GLOBE VALVE
ANGLE BRACKET
12" X 17" PORCELAIN LINED IRON SINK
BRAZE ON REDUCTION PIECE, THREADED FOR GARDEN HOSE
WASTE CAN BE DRAINED OUTSIDE OR INTO A LARGE CROCK
1/4" COPPER TUBE, TAPPED INTO HOUSE WATER SUPPLY

Over the fan is a wooden light-trap. Intake is through a number of holes distributed along the baseboard, and covered inside with a light-trap as illustrated in Fig. 5.

Details of the centrifugal fan and housing are shown in Fig. 6. The fan itself of relatively small diameter is made of duralumin or other stiff sheet metal. It has eight, inch-wide blades set off center, bolted or riveted to a disk of the same metal. Take care to have this in as accurate balance as possible to eliminate noise and vibration. The hub is simply a steel sleeve with screw holding fan to one end, and the armature shaft of motor inserted in the other end, secured with a set screw.

An ordinary porcelain-lined sink is set in

[*Continued on page* 138]



Swivel Head Holds Flash Synchronizer To Camera

A TRIPOD swivel head makes a good coupling unit between a flash synchronizer and a small camera. It provides a good hand grip for the user, and at the same time it permits the unit to be swung to the right or left, for effective shadow control.

Subduing Reflections

IN PHOTOGRAPHING bright nickle, chromium or glass, reflections can be subdued by this new method making use of glycerine. Pat the latter on in a very thin film, and then rub it out smoothly to a matte appearance. It is easily removed later

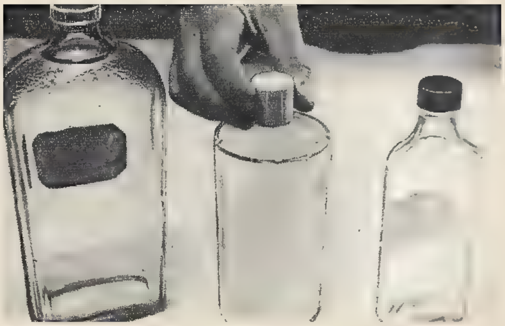
Underwater Photographs

REMOVE one end of a 5-quart oil can, make a hole in the other end for the lens of your camera, and paint the interior dead black. Hold the open end under water, and interesting pictures, free of reflections, will result.

Easy Shutter Release

SLIP a short piece of soft rubber tubing over the cable release plunger so that it will offer some resistance. It will make a gentle "trigger squeeze" necessary, and thus eliminate jarring and fuzzy pictures.

PHOTO

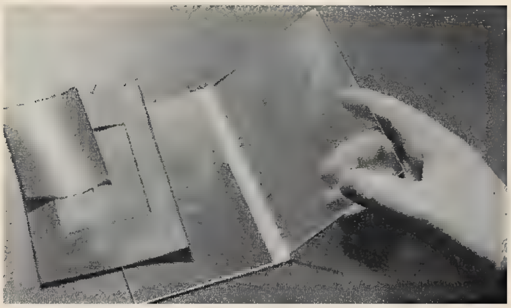


Screw Top Bottles

ASSORTED screw-top bottles found around the house make good containers for photo chemicals because they can be closed tightly. Beverage, medicine, shampoo, mouth wash, shaving lotion and other bottles, in 8, 16 and 32 oz. sizes, are very useful. Clean them out thoroughly before using.

KINKS

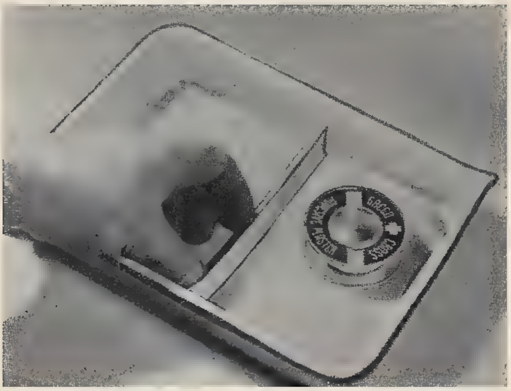
Glass Print Frame



IN AN emergency, two sheets of glass, hinged together at one side by adhesive tape, make an excellent contact printing frame. Put an adhesive tape tab on one glass, as a handle.

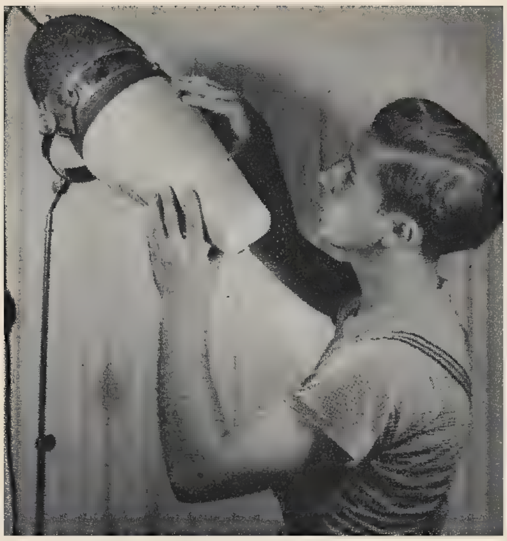
Iron Washer Weights

A SET of prepared weights, made of strings of iron washers or other odd pieces of metal, will save a lot of time when mixing up complicated developers. Tag each string with the weight figure and the name of the chemical.



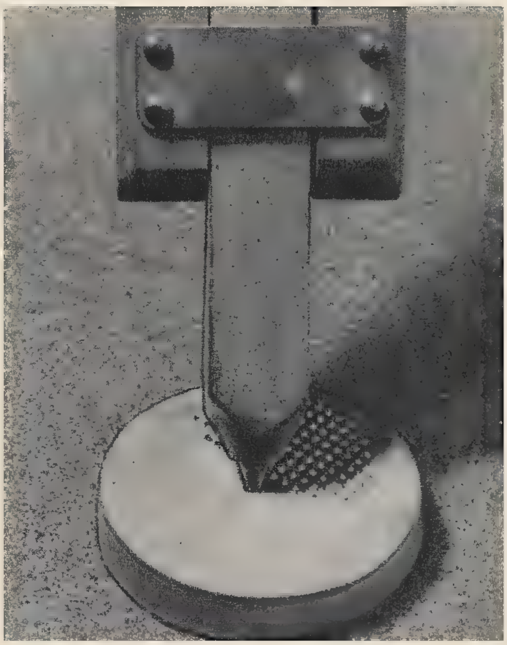
Divider In Tray

PILES of cut film being developed in a tray can be kept separated by a center divider. Make this of adhesive tape, pinched into a T; put it in place while the tray is dry.



Concentrated Light Beam

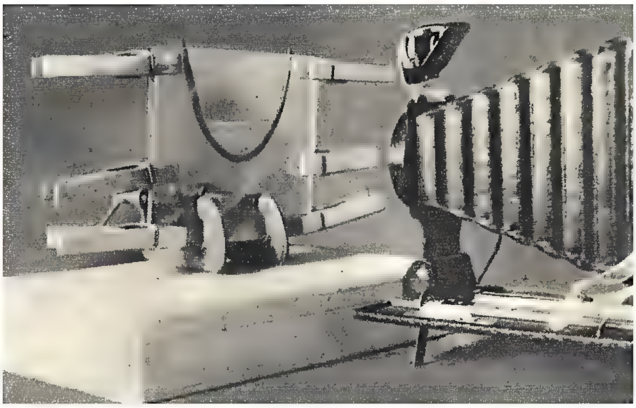
WHEN a very narrow beam of light is desired from a spotlight, slip a cone formed of cardboard over the lens. The inside must be painted black to eliminate reflected light. The same idea can be applied to some types of floodlights. Hold the cone in place with a large rubber band.



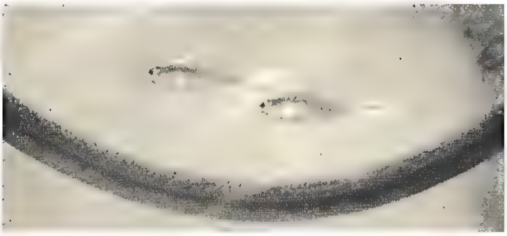
Can-Lid Tripod Support

A NON-SLIP base for tripod legs is quickly made from a can lid, with a hole in the center. This will hold securely on sand, gravel, mud, etc.

Fish Pictures Made Easy



Above—Showing method of assembling thin aquarium. Below—Final close-up shot shows fish in sharp focus. Right—A camera with extension bellows preparatory to taking the picture.



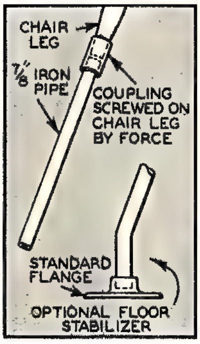
NATURALISTS and photographers wishing to take pictures of tiny fish often find it difficult to keep the fish from swimming out of camera focus before the pictures can be snapped. This problem has been solved by confining the specimen in a thin aquarium made by separating the two sheets of glass with rubber-covered wire slightly thicker than the fish under observation. This allows the fish room to move around but restrains their motion to one plane. The arrangement is particularly useful in handling close-up shots and in studying minute marine life because of the ease with which the aquarium may be brilliantly illuminated from all angles without throwing light directly into camera.

A couple of used film plates or two pieces cut from ordinary window glass, a length of heavy rubber-covered cable, a pair of C-clamps or notched blocks to serve as a stand, and half a dozen spring-type clothes pins comprise the completed aquarium, ready for water and fish. The aquarium may be made any shape desired, depending on the way the rubber is placed between the glass.

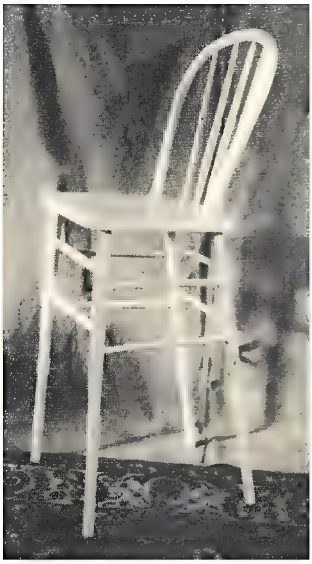
Darkroom Chair

A HANDY way of extending the height of a chair is to fasten iron pipe couplings to the legs. Screw one coupling to each leg. The exact diameter of each leg should be determined before attaching the couplings.

The job of adding the four couplings and threading the four pieces of pipe extension to fit them is simple. For perfect stability the flange may be screwed to the iron leg extensions. If this is done it will necessitate bending each iron leg extension inward in order that the flanges may rest level on the floor. If more than average weight is to be placed on an elevated chair it is wise to strengthen the four extended members with steel wire criss-crossed from each leg.


CHAIR LEG
7/8" IRON PIPE
COUPLING SCREWED ON CHAIR LEG BY FORCE
STANDARD FLANGE
OPTIONAL FLOOR STABILIZER

Above—Detail of chair leg showing method of coupling leg extension to gain added height as shown at right.



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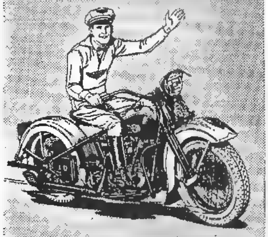

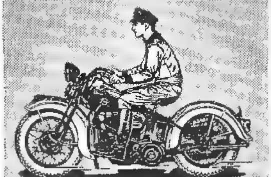

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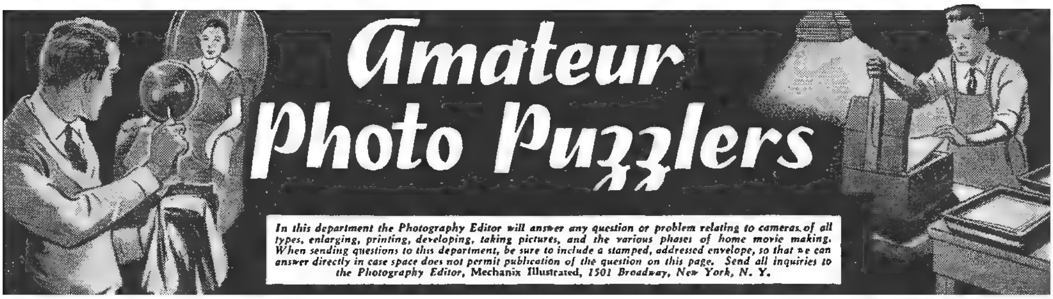

Amateur Photo Puzzlers

In this department the Photography Editor will answer any question or problem relating to cameras of all types, enlarging, printing, developing, taking pictures, and the various phases of home movie making. When sending questions to this department, be sure to include a stamped, addressed envelope, so that we can answer directly in case space does not permit publication of the question on this page. Send all inquiries to the Photography Editor, Mechanix Illustrated, *1501 Broadway, New York, N. Y.*

U. S. DIAPHRAGM RATINGS

What is the meaning of "U. S." on the camera lens and how do the numbers correspond to the "f" numbers?—B. Cuttler, Staten Island, N. Y.

For purposes of standardization, the Royal Photographic Society of Great Britain advanced a system, in 1881, for numbering the diaphragm openings. They took f.4 as a standard and called it No. 1. The system was termed the "Uniform Standard," or "U. S. No." The "f" and corresponding "U. S." numbers for modern lenses are:

f value	4	5.6	8	11.3	16	22.6	32
U. S. value	1	2	4	8	16	32	64

Many of the earlier cameras have the "U.S." ratings, usually beginning with U.S.4. This is equivalent to an f.8 rating.

ANTI-HALATION NEGATIVES

Why are some films marked "anti-halation" and for what is this film used?—Igor Norda, Minneapolis, Minn.

Halation frequently appears when photographing landscapes in autumn or winter, especially where extreme contrasts of light and dark appear or when taking trees against the sky. It is caused by reflection from the back of the plate or film. The remedy is to use a backing on the film. A thickly coated or matt-surface film is most desirable as a safeguard against halation. Films marked "anti-halation" are of this type—usually coated on the back. Matt-surface film is so marked. Regardless of what kind of film is used, however, halation should be guarded against, especially when photographing an interior against the light from a window. The window should either be covered with a slightly opaque cloth, or the light should be counter-balanced by lighting from the inside.

HYPER-SENSITIZING FILM

Are films hyper-sensitized before or after exposure? How is it done?—E. J. Sigmon, Seattle, Wash.

Films should be hyper-sensitized before exposure. A hyper-sensitizing solution may be made by combining the following ingredients:

Alcohol (90%)	5 ounces
Pure ammonia	5 drams
Water	to make 20 ounces

Immerse the film for about 5 minutes in this solution and then dry it thoroughly in absolute darkness as quickly as possible. Although this form of hyper-sensitizing increases the sensitivity of the film, it also increases its tendency to fog and should, therefore, be used as soon after hyper-sensitizing as possible.

BLACKENING INTERIOR OF PHOTO EQUIPMENT

Your plans for building enlargers indicate blackening of the interiors of some of the equipment. What is this blackening solution and how is it mixed?

The interior of all cameras, lens barrels, focusing tubes and film holders should be blackened to prevent reflection of light and consequent fogging of film. A good black is made by mixing lampblack with Japan drier or by mixing fine lampblack with lacquer. In the latter case, two or three coats may be necessary, and is especially recommended for lens barrels that won't be touched by fingers. If aluminum is used for tubing, it may be blackened as follows: Rub the metal clean with strong soda and water to remove all grease. Then coat it with albumen made by beating up the white of an egg and straining it through muslin. The albumen coating is allowed to dry and then the tube is heated to a dull red heat, and allowed to cool. Then clean the surface again with fine emery cloth, give it an even coating of olive oil and heat again until it turns black. The aluminum is again cleaned with fine emery cloth and dipped in an arsenic bath made up by mixing 1½ ounces hydrochloric acid with 1 dram of white arsenic (arsenious oxide) and 1½ ounces of water. Then prepare a solution of 50 grains of gum sandarac to 1 ounce of pure alcohol. When dissolved, add slowly while mixing, 3 grains of nigrosin. Apply this solution with a soft brush and allow to dry.

DISTORTION FROM WIDE ANGLE LENS

What causes distortion at the sides of a picture taken with a wide angle lens?—Helen Whiting, Athens, Ohio.

The wide angle lens, in itself, is not faulty when distortion shows at the sides of the picture. The distortion is simply due to over-zealousness on the part of the photographer to take in too much area, especially when photographing interiors. On landscapes or skylines, the photographer can do little about controlling the angle when taking the picture, but you might find it advisable to crop the extreme sides of the picture when printing, if distortion is apparent.

EXPOSED FILM THAT FOGS

I exposed several rolls of film about three months ago, but only just got around to developing them. All the rolls appear slightly fogged. What caused this condition?—Donald Peterson, Westport, Conn.

Fog on film may be due to a number of causes, but in the case where exposed film was kept undeveloped for several months, the act of keeping the film undeveloped seems to give the answer to the difficulty. Exposed film should be developed as soon after exposure as possible because once light has reached the emulsion, its tendency to fog is greater. If circumstances make it impossible to develop film shortly after exposure, the safest thing to do is to enclose the film in a metal container and seal the lid with wax or tape. This is to protect the film against moisture. Keep the film stored in a cool place, if possible, although dry heat will not prove injurious.

CONDENSATION ON LENS

When I take my camera out of the house, a condensation forms on the lens which results in fuzzy pictures. What causes this?—D. G. Anderson, St. Louis, Mo.

When taking a camera from a warm house into cold air, condensation will form on the lens and if a picture is taken before the lens has cleared, the resulting picture will not be sharp or brilliant. This is due to the difference in temperature. The best procedure is to open the camera immediately upon leaving the house so that the lens will have time to acquire the outside temperature. The lens in a closed camera takes longer to adjust itself to the cold temperature than when the camera is open.

MECHANIX ILLUSTRATED AWARDS $40 EACH MONTH FOR BEST PHOTOS SUBMITTED BY READERS

The editors of MECHANIX ILLUSTRATED distribute $40 in cash awards each month to the five persons who, in their opinion, submit the best pictures suitable for publication in the MECHANIX ILLUSTRATED Photography section. Full particulars regarding these awards will be found in this issue on page 119.

3 NEW KODAK FILMS
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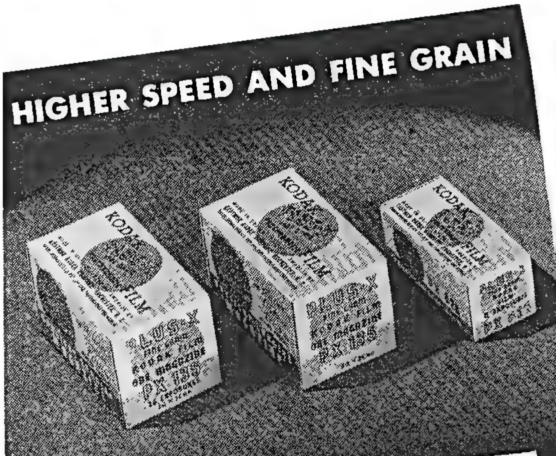

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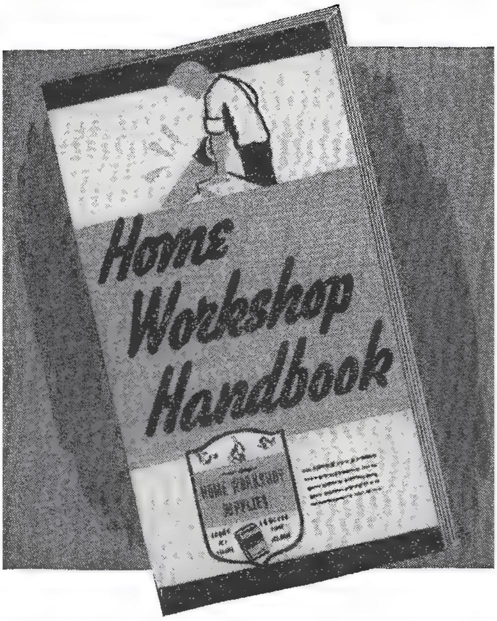

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Copper Entrance Lantern

[*Continued from page* 89]

While doubtless many finishes such as lacquering or coloring could be given the finished lantern the writer preferred only to polish the project thoroughly with fine steel-wool and let nature do the eventual aging. Needless to say should the lamp be used for an interior hall lantern a lacquer finish, to preserve the copper color, would be advisable.

Since the method of hanging will vary with taste and necessity, no details of the bracket have been offered. It could however be easily reproduced from the photo, in which case the following dimensions would offer a starting point. The vertical side of the right angle of the bracket is 18" and the horizontal side 36" O.A. The wiring is brought down the top of the long side, which is then capped with an inverted channel of sheet iron (gal) to hide and protect it.

The entire lantern may be made from a piece of sheet copper eighteen inches by twenty-six inches. The copper used for the original was about 26-gauge.

Indoor Bicycle Exerciser

[*Continued from page* 93]

From 1" hardwood saw two discs which can be driven into the fork post. Then drill these at the center with a 7/16" drill.

An 18" length of ½" pipe is next flattened at the center and drilled with a 13/32" drill. A ⅜" bolt about 7" long is now inserted in the hole in the pipe handlebar, through the holes in the plugs in the fork post, through a bevel washer and then through the hole in the 'A' frame. Add a lock washer and nut and tighten. Rubber 'cane' feet are then placed over the ends of the pipe 'A' frame, and rubber handle grips are used on the handlebar.

The devise which regulates the pressure is very simple and very effective. From a block of hardwood 2"x1½"x4" saw out an arc of 10" radius. Drill two 9/32" holes in this and counterbore these from the curved face with a ⅝" drill. Bend a piece of metal 1½"x⅛"x7½" long to fit this block and drill the metal for attach-

[*Continued on page* 145]

Three 00 Gauge Model Cars

[*Continued from page* 91]

Secure a sheet of 5-ply bristol board from your stationer or artist supply house and mark out the sides in pencil. Mark the window openings without the sashes as these will be put in later. A razor blade or a very sharp knife should be used to cut out the window openings.

[*Continued on page* 150]

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Is Your Drinking Water Pure?

[*Continued from page* 113]

all of the water and pour the remaining few drops with all of its precipitate into a small beaker. Examine under a lens or microscope and note its character. It may consist of settled mineral matter or organic matter or both. If, on heating, this residue turns black or brown, too much organic matter is present.

Now pour some of the water under test into four test tubes using about twenty drops for each tube. Into one test tube pour a few drops of methyl orange indicator. If the color changes to red acid is present. If no change in color takes place discard the contents and add phenol

[*Continued on page* 153]

Build U. S. Coast Guard Boat

[*Continued from page* 118]

cut the main keel to fit between them. Trim all uneven edges until they fit perfectly. Then glue them permanently into position. Be sure that the three pieces are exactly in line.

The molding that goes around the side and top of the hull is placed next. With the exception of the piece in the bow, it is 1/16" square bass wood, held in place with glue. The bow piece is made of two lengths of bass 7½" long x 1/16"x⅛".

Now turn the hull upside down and prop it up so that it rests on two small blocks of wood, with molding and deck well clear of the table. Mark off the positions for the outer propeller shaft holes. The holes for the side shaft tubes should be 3/16" in diameter and at least ½" deep. The holes are 7½" forward of the stern and are slanted so that the propeller ends are 2" below the deck line.

[*Continued on page* 148]

An Anchor Tie Rack

[*Continued from page* 87]

line which runs from one tip of the anchor to the other. Put a small drop of glue in each hole, then cut the skewer sticks each 2¼ inches long and push them into the holes.

Apply 2 coats of clear lacquer or varnish, or white shellac, rubbing down the first coat with about No. 000 steel wool before the second is applied. Walnut, mahogany and other coarse grained woods should have wood filler rubbed into the surfaces.

When finished, the tie rack is fastened to a window casing or the back side of the door with a single screw put through a small hole bored for it through the top of the anchor. The size shown for the anchor is about right for the average boy's room, but it can be made larger or smaller if desired. Also, more pegs can be inserted if required. The board from which the anchor is cut should not be less than ½ inch nor more than 1 inch thick.

Hail From Heaven

[*Continued from page* 73]

apart and hit the soft earth with such force they were virtually buried.

The largest stone was split and found to be made up of a series of ice layers, one ring cloudy the next one clear, and so on throughout the specimen. These rings told the story of its journey through the atmosphere and convinced weather men it had been built up as a single stone and was not just a cluster that had congealed, as frequently is the case with superstones found after a heavy fall.

To digest some of the hail stories collected by the gaunt Kansan one needs a whole bucket of salt instead of a few grains. For example, he tells of several houses being crushed by hailstones weighing 4½ pounds on June 15, 1829, at Cazorla, Spain. A similar storm at Cette, France, in October, 1844, he says, not only demolished several shops and houses but also sank a few vessels off shore.

In his opinion, few, if any hailstorms can compare in destructive violence with the one that hit Transvaal, Africa on February 1, 1936. Within a half hour's time, hailstones fell to a depth of three feet and resulted in the death of nineteen natives and many cattle as well as the obliteration of entire crops.

Farmers in southeastern Iowa still call for a cool drink of water every time they think of the storm that swept over their lands August 18, 1925, and cost them $5,000,000, and Kansas farmers still are talking of the heavy losses in their state a decade ago, which amounted to an estimated

[*Continued on page* 154]

Hand Tooled Aluminum Tray

[*Continued from page* 95]

sheet aluminum, and measures 8½″ wide by 14″ long.

To make this tray, start at a line ⅝″ in from the edge and raise the edge with the ball pein hammer as illustrated.

One-half inch in from the first line cut a parallel line all the way around with a blunt cold chisel, and planish that section between the two lines.

Draw or trace the picture of the crane in the center of the tray, and outline this with a blunt cold chisel. The eye is set in with a hollow end nail set, and the tail feathers are done with a sharp cold chisel.

The background may be set down with any tool available. The handles are made from aluminum of the same gauge, and are hammered and rolled into shape. Drill rivet holes in the handles, and corresponding holes in the ends of the tray, and rivet the handles in place with aluminum rivets.

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"Autoset" Enlarger

[*Continued from page* 125]

ting it to stick together unless you let the glue dry to stickiness first. The lens board, 4x3¼x½ inches carries the lens, which should be of 5-inch or 5¼-inch focal length. The model shown has only an old Kodak double meniscus lens with two stops swung into position by turning a knob. There is also a built-in filter made of red cellophane.

A 5 to 5½-inch focal length lens is suitable for film of the following sizes: 1⅝x2¼; 2¼x3¼; 2½x4½; 3¼x4¼"; 9x12 cm.

Build the negative carrier of plywood and cigar-box wood to hold two 5x7-inch plates of glass between which the negative is placed. The top glass is held down by a close fit.

The whole enlarger is supported by an arm as shown in Fig. 1. Cut it from one inch thick wood 4¼ inches long and, holding it against the pipe, wrap a piece of heavy tin or light galvanized iron around it and the pipe. Fasten the iron to the wood with several screws and bore a hole through the whole thing so that a bolt in the hole will bind against the pipe tightly enough to clamp it into position. The handle of the bolt was made from part of a worn-out faucet. With a round file cut away one side of the bolt so that it will slide easily until locked by a quarter turn. This arrangement has proved more satisfactory than the usual set screw clamp used, which calls for tapping threads and a heavier construction throughout. The pipe is one-inch outside diameter brass or iron, screwed into a flange fastened to a baseboard 12x15 inches or larger. The wiring runs up through the pipe and ends in a socket taken from a curling iron. Into this, plug the wire from the lamp, fitted with the other part of the curling iron.

When you have the enlarger finished and painted a flat black inside below the opal glass, place ground glass in the negative holder. Mark off some inch marks on the ground glass and also include a bit of cellophane with some fine printing on it from a candy wrapper. This is a good thing to focus on. Put a ruler on the baseboard and focus the enlarger to the smallest enlargement it will make. Put a pencil mark on the pipe and another where the bottom of the lens board comes. Proceed in the same way to get as many settings as you want to the limit of your enlarger. You will probably find some of the marks appearing a bit off in respect to others, but both scales can now be corrected on the drawing board by the following method. (See Fig. 6.) Transfer each scale to a piece of paper and well to one side and above it establish a point at random. Draw lines to each point in the scale and then juggle a ruler around across them until each line hits at an equal point on the ruler. You will then see which points are off and can make the necessary corrections. Put your corrected scales on the enlarger.

Cut out the slide rule, (Fig. 4), and paste it on a piece of thin wood or heavy cardboard. Cut where shown with a razor blade and glue the outside stationary part to a baseboard of the same size. The slide is kept from falling out by the slant given to the cuts. Mount it on the enlarger and you are all done and ready to go.

Suppose you have a 2x3-inch negative which you are going to enlarge to 5x7 inches. Pull out the slide until No. 2 on the stationary or top rule is even with No. 5 on the slide. No. 3 will then be at 7½. The arrow at the left points to a blow-up of 2½. Set each focusing scale at 2½ and you are ready to print. Or take a figure in a negative which you wish to enlarge to 9 inches. Lay the negative over the inch ruler and you will find it is perhaps 2¾ inches high. Setting 2¾ inches to 9 inches on the slide calls for a blow-up of 3½. A 2¼x3¼-inch negative will come up to approximately 5x7 inches or to about 7x10 inches with a three-times blow-up.

Built-In Darkroom

[*Continued from page* 127]

the workbench, Fig. 7, and supplied with city water from a small globe-valve connected to water pipe with a copper tube. An elbow is tapped rather than a straight pipe as it has a thicker wall for the threads, Fig. 8.

Waste water from the sink can be drained directly into a large crock or a garden hose attachment fitted, and the hose carried through a hole in the baseboard and out-doors. Or, as in the original, a hole is bored directly under the wastepipe into the floor, and a hose leads out to garden shrubbery.

Windows, casement or sash, can be blocked off by fitting panels of plywood in the frames and sealing edges with photographer's "Scotch" tape. If light still creeps in along the edges of ill-fitting frames, hang an army blanket over the window. The original windows are blocked as in Fig. 9 A doorless, light proof entrance can be built as in **Fig. 10** if space permits.

I Risk My Neck For A Thrill

[*Continued from page* 51]

of seconds more and I was washed out the back window. I was badly stunned and scratched up but the cold water revived me and I suffered no permanent injury.

Ironically enough, one of my greatest thrills took place not long ago when I wasn't even attempting a stunt. This was at San Angelo, Texas. I was driving back to my trailer camp after making a personal appearance at a fair. I was scooting along at about 45 miles an hour when the structure gave way and I shot over the side and dove into 25 feet of water. The car turned over completely. Incidentally, my wife was with me. Luckily neither one of us was more than slightly scratched.

Speaking of my wife—a pretty blonde—she does stunts, too. Or rather, she used to. For a couple of years one of my regular performances was to place her underneath a narrow board and then ride a motorcycle over her back. But the board gave way one day and she suffered a long sojourn in a hospital. She hasn't stunted since.

Movies in which I've appeared include: "Mutiny on the Bounty," "Hell's Angels," and "Perils of the Highway," the latter a film produced by the National Safety Council of Chicago.

In "Mutiny on the Bounty" I took the part of the sailor who jumped off the spar during the hurricane and was sucked under and killed. In "Hell's Angels," sad to relate, the part I played in this picture was never actually shown to the general public. I died in the cutting room. Nevertheless it was a thriller if there ever was one. I cracked up the ship, after telling the cameramen exactly how to angle their cameras. But they missed the shot! Reason was, I had to come down about 200 yards away from the spot I was supposed to and they couldn't quite catch the scene. I was supposed to be in a German plane, shot down in a dog fight at close quarters.

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Using Exposure Meters

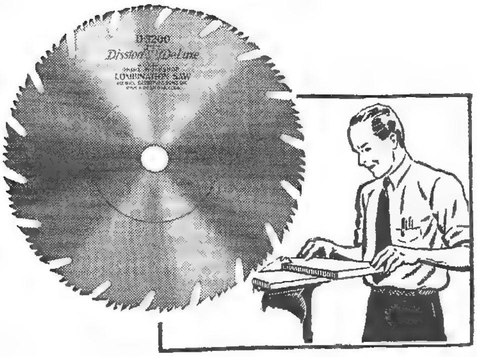
[*Continued from page* 121]

may lie outside the arrows, in which case the extremes will be sacrificed. In this case you may sacrifice either the highlights or the shadows. To sacrifice the shadows, place the extreme arrow against the highlight reading, but to save the shadow detail and sacrifice the detail in the highlight, place the other extreme arrow at the reading corresponding at deepest shadow.

As a rule, when a meter is used which does not have the differential dial, you may assume that the deeper shadow may safely call for an exposure five times the normal, while the highlights may be assumed to require one-tenth of the normal. In short, you may usually count upon making use of an extreme range of one to fifty and still preserve a printable range of tone.

To make this more clear let us assume that we have a light reading of 50 for normal exposure of a certain scene. In this case if the deepest shadow is not darker than 3.2 and the brightest highlight is not brighter than 400, it is safe to make the exposure 1/50 second at f.4.5. Suppose in actual practice you read the deepest shadow and find that your reading is 8. You read the brightest highlight and find that your bright highlight is 500. Your actual range is

[*Continued on page* 140]



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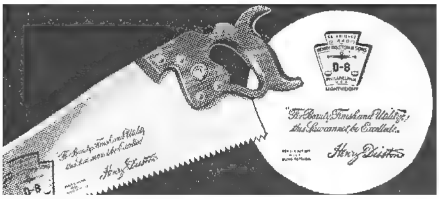

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A Bronze Box And Lid

[*Continued from page* 114]

mold in the usual way with the half-inch rod in place. When the flask has been packed and smoothed off, the rod is withdrawn, the flask top lifted off and the pattern removed. Then the top half of the flask is replaced.

The best proportions for aluminum bronze are: 88% of copper and 12% of aluminum. Before pouring the metal, skim off all slag to prevent blemishes. After pouring, let set for a minute then knock off the sand and dip in water. Use the two-inch center shank to hold the box in the metal lathe.

In like manner cast the lid casting, making sure that the same metal proportions for the alloy are used so that the finished job will have the same tone of yellow as the box casting.

From here on, it's just a matter of machining

[*Continued on page* 145]

The MI Music Booster

[*Continued from page* 96]

The 6B5 power tube also consists of two triodes dynamically coupled internally, and, at its operating voltage of 325, delivers 5 watts in Class A. This tube requires no cathode bias and draws no grid current, so the design of the amplifier becomes simple and economical. The coupling condensers are mica, the values specified being de-

[*Continued on page* 146]

Unravel Secrets Of Bee Life

[*Continued from page* 107]

bee, being sure to sever each one exactly at the body wall and to include the two small basal segments so that each appendage will be complete. Boil these legs in a 10% solution of potassium hydroxide (caustic potash) for 15 to 30 minutes or until they appear light in color, soft in texture and more or less translucent, using an evaporating dish, a small discarded tin can or other vessel suitable for this corrosive fluid. A bit of experience may be necessary, as it is easy to go too far with this step and boil the legs to pieces; the action must be checked in time.

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Using Exposure Meters

[*Continued from page* 139]

from 5 to 650 and to get the two readings balanced you will give the exposure which is normal for 80, which is 1/80 second at f.4.5.

A mistake often made by beginners is to compare one meter with another. In many cases two meters of different make will not agree. There is even marked variation between identical meters of the same make.

With every meter there is a published list of film speeds. The experienced photographer, when purchasing a new meter, makes a test using the published factors. For example, he is using super sensitive film at a rating of 24. When he develops a film, if he finds that the exposure has been too little, he makes a note that in the future he will try 16 or 20 as the factor for super-sensitive instead of 24. If he finds that he has over-exposed he will then make a practice of shooting super-sensitive at 32 or even at 40, and other types of film will be compensated for correspondingly. The one evidence of intelligence in using exposure meters is to verify the published factors against your own experience.

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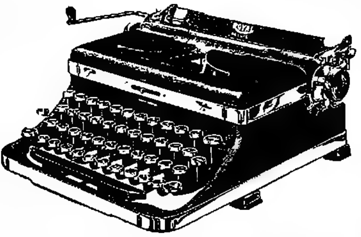

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Unravel Secrets Of Bee Life

[*Continued from page* 140]

Then it is imperative to wash the legs thoroughly in several changes of water to get rid of the potash; running water is still better. Place next in 50% alcohol to which one drop of hydrochloric acid has been added to neutralize any remaining trace of potash, and do this in a Syracuse watch glass, as positioning of the legs now needs attention. Alcohol will harden tissue and so each leg must be straightened or bent until in the desired position, then weighted with small strips cut from a microscope slide with a glass cutter.

After one or more hours, the length of time not being critical, pipette off the acid alcohol and replace with 70% clear alcohol. Continue dehydrating through the alcohol series to xylol, one-half hour or longer in each; transfer the legs to a slide and mount all three on one slide, arranged in a row in correct order. Use bits of a broken glass slide as cover props and apply thick balsam and allow plenty of time for drying.

Inspection of the finished slide will show many structures on these legs that are put to a large number of diverse uses by the bee, and after studying them it is great fun to watch a bee closely in the field and see these ingenious adaptations in operation. Space does not permit a full description here, but you will find one in almost any textbook of biology or zoology. In it will be found information on the antenna cleaner, pollen brush and eye brush on the first leg; the pollen brush and pollen spur on the second leg; and the pecten, auricle, pollen combs and pollen basket on the third leg, all of which have to do with the collection, transportation and handling of pollen in its journey from flower to hive.

The third type of slide to be discussed here requires considerably more work and skill, and involves staining in addition to steps already given. This is to be a finished slide of the entire stinging apparatus, and the story it tells will amply repay the effort necessary. Kill a bee by drowning it in a bottle of water. Allow it to rot in the water for 24 hours, then place in a Syracuse watch glass of fresh water. Grasp the sting of the bee with a forceps held in the right hand and pull gently, at the same time pressing lightly on the abdomen of the specimen with the left forefinger. This should expell the whole works intact, but inasmuch as several trials may be necessary, it will be well to have a supply of soaked specimens ready in advance in case of failures.

[*Continued on page* 148]

Win Air Trip To Hollywood

[*Continued from page* 71]

greatest hero, or that Rickenbacker, Luke, or some other World War ace deserves that rating. Write about any man you believe to be worthy of the title "Aviation's Greatest Hero", but be sure to explain why you selected him. Contestants' letters will be judged on reasons given for the selection made, and for sincere expression. Fancy language will not count. Write your entry with pen and ink or use a typewriter.

CONTEST RULES

Anyone except employees of Paramount Pictures and Fawcett Publications can enter the contest. The prizes will be awarded to the 21 persons who, in the opinion of the judges, send in the most nearly correct answers to the ten aviation questions listed in the box on page 71 and the best 25-to-50-word letters on the subject —"Who Is Aviation's Greatest Hero?"

Editors of this magazine are the judges in this contest and their decisions will be final. No entries will be returned. Contestants have until midnight of December 27, 1938, to mail in their

[*Continued on page* 146]

The Amateur Guncraftsman

[*Continued from page* 77]

Formula No. 1
The Rapid-Penetrating Process

3 lbs. 1 oz. sodium hydroxide (caustic soda flakes)
1 lb. 1 oz. trisodium phosphate
3 oz. sodium chloride (common salt)
5 lbs. 1 oz. sodium nitrate
10 lbs. water (1 gallon weighs 8.355 pounds)

Weigh out all the chemicals, place them in the galvanized tank, and then add the ten pounds of water. It will be found necessary to increase the amount of chemicals and water in proportion to the size of the tank used. But as the water evaporates from heating or from standing any length of time, it is necessary only to add enough to keep it always at a certain level.

Once this formula is prepared in the tank, all that you need to do is to heat the tank on the gas stove, bring the mixture to the boiling point, drop the metal parts into the tank, and allow them to remain for ten minutes. They are then removed and thoroughly washed in hot water to remove any traces of the chemicals, allowed to dry with the heat remaining in the metal, and given a coating of the prepared oil described in Chapter XXIII to kill further chemical action. (one part lanolin (anhydrous) in two parts chloroform and add six parts of benzine).

Any number of parts can be blued at the same time in the large tank, but when a number of small parts are to be blued, a small vessel should be selected which can be partly filled from the large tank; and when the smallest parts of a single firearm are to be blued, it will be found necessary only to heat the vessel over a Bunsen burner, or over a gas stove, to produce the desired results by boiling them for ten minutes.

When the solution begins to lose its strength, a little more sodium nitrate should be added (the commercial sodium nitrate used as a fertilizer can be used), but the total amount should never exceed the figure given in the formula. Never wash the metal parts in a lye solution to remove any grease; use a caustic soda solution instead.

The Mummy Cloth Mystery

[*Continued from page* 61]

Martin J. Connolly, who has decortication machinery in operation in an experimental laboratory at Live Oak, Florida, where a 65-acre experimental ramic farm is located.

Colonel Connolly's "mechanized fingers" for decorticating ramie consist of an electrical breaking machine which breaks the dried ramie plants into pieces 2 to 3 inches long. The arrangement is such that the ramie fibres run through mighty macerating maws—powerful corrugated rollers with screw regulators that govern the pressure.

[*Continued on page* 154]

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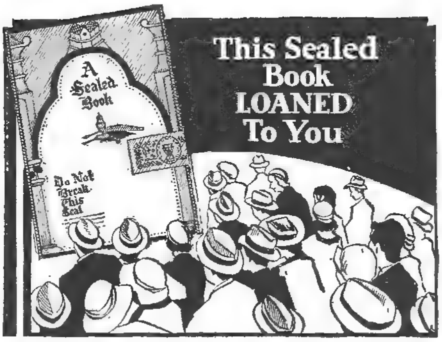
I Risk My Neck For A Thrill

[*Continued from page* 139]

In "Perils of the Highway" I crashed about 20 automobiles. Ran 'em down hillsides, mountains, valleys and rough fields. This was a safety picture filmed for the National Safety Council of Chicago.

Why do the movies use so many stunt men and doubles? Well, take a striking example. It was the time Dick Grace, one of the best known stunters of all time, broke Hoot Gibson's back. It happened during the filming of a Western picture. In a kitchen fight Hoot (who at that time insisted on doing all his stunt work himself), was pushed over a table by Grace, who portrayed the role of the villain. In the terrific struggle one of Hoot's vertebrae was broken. This was back in 1929. Since then the movie magnates have placed a clause in the contracts of virtually all stars and featured players that prohibit them from performing any stunt that may prove dangerous. For it is obvious enough that if the star is injured, the entire production is tied up and thousands of dollars keep pouring out for salaries, property rentals and so on, with very little being accomplished in the way of progress for the picture.

Are movie stunts real or faked? Most of them these days are not faked, contrary to popular belief. This is because the camera eye is many times more penetrating and revealing than the human eye. So in order to achive the realistic effects which the movie-going public has come to demand, stunt men must be utilized. They must be highly trained in both mind and body for every conceivable type of life-risking feat. Last year at a state fair in Minnesota, I took a number of tests showing my reaction time to various stimuli while driving a car. I had the quickest time of anybody who took the tests. Which is just as well. For a fraction of a second means everything in the life of the stunt man.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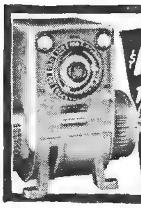

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Indoor Bicycle Exerciser

[*Continued from page* 134]

ment to the block with woodscrews. Before assembling this, bend and drill a piece of metal 1″x3/16″x14″ long. Bolt this piece to the wood block then screw the metal shoe in place as shown. Bend the bracket and bolt it to the lever. Locate the shoe assembly directly over the center of the wheel and drill a 7/32″ hole through both members of the rear fork. Cut two pipe spacers from ¼″ pipe to prevent any side play and assemble, using a 3/16″ bolt about 4½″ long.

Grind off the round head of a carriage bolt (¼″x4″ long) and drill a ⅛″ hole through the head. There should be at least 3″ of thread on this bolt, so you may have to cut additional thread on it. Then select a tension spring about 4″ free length from a screen door spring and loop one end through the ⅛″ hole in the bolt. Bolt the other end to the hole in the mud-guard support bar. Now insert the long bolt into the hole in the end of the lever and add a wingnut. An initial adjustment may be necessary here and this may be done at the spring. The lightest tension should be when the wingnut is down. Bend the lever if the shoe has any tendency to bind in the loose position.

In the event that you wish to make the saddle, the drawing shows the half-plan of a suitable shape the base of which is a piece of ⅝″ plywood cut to this shape and drilled for two angles. The wood is padded with felt or other material and covered with leatherette, tacking this to the bottom. Then bolt the angles on the saddle to the saddle post via a standard saddle clamp.

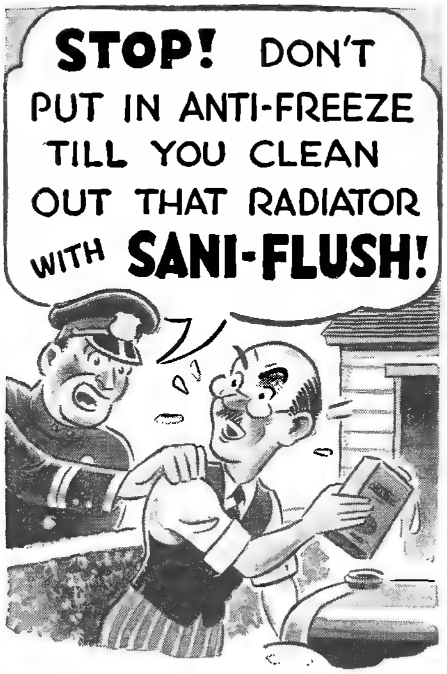
A Bronze Box And Lid

[*Continued from page* 140]

in the metal lathe. Fit the box casting in the lathe chuck, bottom side out, center and machine off the center rod and the bottom. Then reverse and turn the inside and top lip to shape. Speed up the lathe and polish with No. 000 steel wool and finally rub it at high speed with a cloth on which pumice has been applied. Then, machine the lid to fit.

Another way to turn the box or lid is to cut off the rod of metal which fills the hole in the mold left by the half-inch iron rod, machine the half of one side then reverse in the chuck, using strips of copper or brass between finished surface and chuck jaws to prevent marring. If you wish you can turn a small knob on the top of the lid. Finally, polish with a buffing wheel at high speed on which pumice and beeswax has been rubbed.

A new kind of paper for photographic prints is said to be really durable, neither turning yellow nor brittle.



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Win Air Trip To Hollywood

[*Continued from page* 142]

entries, and the winners will be announced in the March 1939 issue of MECHANIX ILLUSTRATED. Address entries to: Contest Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

PRIZES

First prize in the big "Men With Wings" contest will be the free round-trip airline trip to Hollywood, California, as well as the added treat of visiting the Paramount Studios, meeting movie stars and visiting the Douglas Airplane Company plant in Santa Monica.

Second prize will be a famous World's Champion Baby Cyclone miniature gasoline engine for model planes and boats donated by Aircraft Industries of Glendale, Calif.

Third prize consists of a complete kit of parts for assembling a six-foot Comet Clipper gas-powered model airplane (less engine) donated by the Comet Model Airplane Company of Chicago, Ill.

Fourth prize will be an Atwood "Phantom" miniature gasoline motor donated by Phantom Motors of Los Angeles, Calif.

Seventeen other excellent prizes, in addition to those mentioned above, will be awarded to the 17 persons who, in the opinion of the judges, send in the next best correct answers and most interesting letters.

A complete list of prizes will appear next month, but right now the thing to do is to see the picture "Men With Wings", answer the ten questions listed on page 71 and send them to the contest editor together with your 25-to-50-word letter on the subject mentioned above.

The MI Music Booster

[*Continued from page* 140]

signed to provide amplification flat to within 1 db from 50 cycles to 10,000 cycles for each stage, with the grid leaks shown. If higher values of grid leaks or coupling condensers are employed, the amplifier is likely to "motor-boat." The imput stage plate circuit is filtered by R5 and C2, for stability. No filter is required in the second stage —in fact, it would cause instability.

The entire amplifier is assembled on a panel measuring 4 by 14¼ inches. The layout is shown in the photograph. The tall electrolytic condenser unit contains C6 and C7 which should be connected in parallel for the first power supply filter section. The smaller condenser unit contains two 8 mf. condensers of the same rating. Because the larger can dissipates heat better than the smaller one, it is used where the voltage is highest in this particular layout.

The speaker has a tapped field coil which is used as the filter choke. The blue and black leads include 1,800 ohms of the field coil required to give proper voltages and speaker excitation in this design. The output transformer also is tapped. The 6B5 should operate into 7,000 ohms which is secured by connecting the green and blue primary leads as shown. The secondary leads should be connected across the terminals marked "M" on the output transformer. All unused leads should be taped individually.

The overall gain of the amplifier is over 82db. This is plenty for low-level double-button carbon, Velotrons and many diaphragm-type crystal mikes, but a pre-amplifier will be necessary for sound-cell crystal or lew-level velocity types. The contact microphone with which this outfit is designed to be used is rated at minus 40 db so there is plenty of reserve gain in the amplifier.

Full instructions for attaching the microphone to various instruments are included with the mike. For tap-dancers, the mike is simply placed on the floor near the dancer.

Many other applications can be made of this apparatus. It can be used for locating noises due to friction in bearings, amplifying clock ticks, picking up speech vibrations in wooden partitions, etc.

There are no particular constructional difficulties. The speaker is first mounted on a Celotex baffle which should be from 12 to 14 inches square. The speaker assembly is then screwed in place. The amplifier shown was built on a piece of quarter-inch wood veneer strip. It was found necessary to ground the power transformer core to B minus to eliminate a slight hum. No external ground is necessary.

An external volume control, operated by foot rather than by hand, can be obtained from the microphone manufacturer if so desired. This leaves both hands free to play the music instrument. In the apparatus shown, both the volume control and mike jack are located on the side of the carrying case.

This apparatus is intended for moderate amplification at high quality rather than deafening volume. In very noisy surroundings with the weaker plectrum instruments, additional amplification may be obtained by using a matching transformer between the mike and the input circuit of the amplifier. The microphone shown has an impedance of 2,000 ohms. A transformer with one 2,000-ohm and one high impedance winding can be used to provide additional step-up. Or a low-impedance mike, also available, can be employed.

For small string orchestras, several microphones may be paralleled and fed into the same amplifier. Each may be separately controlled so that the music from any one or more instruments may be emphasized.

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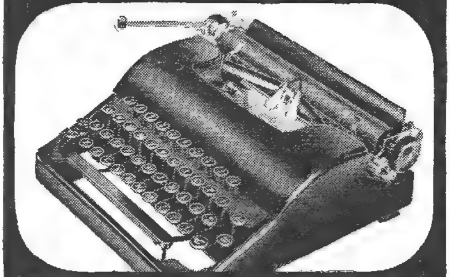

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Unravel Secrets Of Bee Life

[*Continued from page* 142]

Examine with a hand lens or mount the watch glass under the lowest power of the compound microscope and compare with the labeled illustration to see that all parts are present, rejecting torn, incomplete or mutilated examples. When a perfect preparation is obtained, suck up all the water with a pipette (medicine dropper) and replace with 10% formalin. Never allow the tissues to become dry at any stage. Prick the large poison sac with a fine needle so that the formalin will be sure to penetrate and preserve. After thirty minutes, pipette off the formalin and replace with water, the step known as washing and the action that of getting rid of the fixer once it has done its work. The water should be changed at least twice over a period of fifteen minutes.

Draw off the water and add a stain made by mixing one gram of eosin (the dry powder) with 100 cc of distilled water, or use the ready-made solution if you have the stain in this form. Light green, also in 1% solution is equally good. Borax carmine, alum cochineal and still others are excellent, but if none of these are at hand you may use powdered rouge boiled in water as a 1% solution, or with dilute mercurochrome, though the results will not compare with those of first-class biological dyes.

Stain for five minutes and then examine under magnification. If too weak, allow the stain to act longer, but avoid intense colors. Wash thoroughly in several changes of water by the pipette method to check the staining action and to remove excess stain. Overstaining may be corrected by adding one drop of hydrochloric acid to the washing water, but this bleach will act rapidly and must in turn be checked and washed out before it goes too far. Add a tiny pinch of soda to the last washing water, if acid is used, to correct any remaining trace of the acid, then pass in succession through the graded series of alcohols—50, 70, 85 and 95% strengths, five minutes in each.

Apply absolute alcohol for five minutes. If not available, use carbol-xylol (melted carbolic acid crystals, one part; xylol, two parts), then in either case next put on xylol for five additional minutes, after which carefully transfer the specimen to a slide. This is best done by getting under the stinging apparatus with a thin strip of metal or cardboard, lifting up, and depositing in several drops of xylol on the slide. Arrange all parts symmetrically and spread out without overlapping, then remove excess xylol by careful tilting or with blotting paper, add balsam and cover glass props, then the final cover glass.

When you study this slide and work out the parts you will appreciate the full significance of what happens when a honeybee backs up and pushes! You will find no sting on the drone, since it is a modified egg-layer and hence confined to the female sex, and will no doubt recall Kipling's classic remark about the female of the species. Likewise the drone and queen, since they do no foraging afield, lack the adaptive structures already mentioned on the three legs.

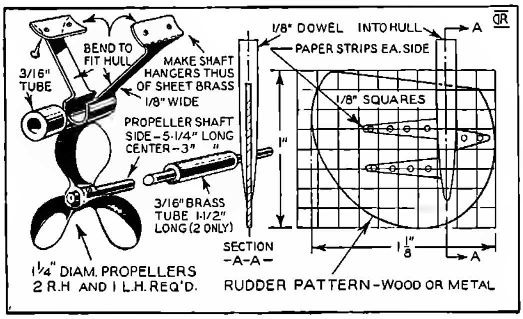
The antennae or feelers make a simple mount of the wing or leg type, those of the drone showing greater complexity this time because having a larger number of sense organs. The cornea of the eye may be peeled off and mounted entire to show the numerous facets, and lastly we may mention the mouthparts, to be dissected out as a single piece and mounted without either potashing or staining, but after careful fixing, dehydrating and positioning. These show parts designed for both chewing and sucking and are most intricate and ingenious.

Build U. S. Coast Guard Boat

[*Continued from page* 136]

The shafts can be made from a length of brass tubing, or ready-made assemblies can be purchased from most model supply houses. The two outer shafts are 5¼" long and the center one is 3" long. The center shaft should be inserted in a hole in the rear end of the keel. No tube is used for this shaft.

The shaft hangers can be made of cardboard or metal cut to the shape shown in the detail drawing. Remember that when all the shafts are placed, they should be at the same angle. The propellers can be made of cardboard and wood, but the ready-made variety can be purchased so cheaply that usually it is not worth while to make


BEND TO FIT HULL
MAKE SHAFT HANGERS THUS OF SHEET BRASS 1/8" WIDE
3/16" TUBE
PROPELLER SHAFT SIDE-5-1/4" LONG CENTER-3" "
3/16" BRASS TUBE 1-1/2" LONG (2 ONLY)
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1/8" DOWEL INTO HULL
A
PAPER STRIPS EA. SIDE
1/8" SQUARES
1"
1⅛"
SECTION -A-A-
RUDDER PATTERN-WOOD OR METAL

Details of propellers, hangers and rudder. The rudder can be made either of wood or metal. Wood may be preferred because it can be worked more easily than metal.

them. One left-hand and two right-hand propellers are used. Fasten them to the shafts, the left hand propeller in the center.

When making the rudder, use the squared pattern shown in the drawing. It can be made either of wood or metal, but wood is suggested because it can be trimmed to shape more easily.

When the hull is finished, it is ready for its first coat of paint. If the two-lift hull is used, it should be taken apart and each piece painted with two coats separately and then fastened together permanently with a good grade of glue. At least three coats should be applied, sandpapering with No. C0 before each coat. Do not sandpaper the final coat. The propeller shafts, propellers or hangers should not be painted if they are made of brass.

The water line, or boot, is painted on a piece of high-grade gummed paper and pasted in place after the hull is completely dry. Then the hull is turned upright and the deck is marked off with a hard pencil to give the appearance of planking.

Dimensions and positions of the fittings are shown on the drawings. All deck houses are solid pine, but they can be made of cardboard if desired. Each fitting should be cut to size, painted and then glued in place. The cowl ventilators are carved from bass or balsa wood. They are faced with a small disc of cardboard as shown in the drawing. The ventilator chart gives their heights.

The guns are built up of dowel stick glued together and mounted upon tripods of 1/16" square bamboo. Do not try to make them moveable. Glue them in place on the deck and bridge. The rail around the bridge and atop the pilot house 1/16" bamboo bent to shape and glued in place with quick-drying cement.

The lifeboat is carved from a scrap of pine wood. It is painted white and a plain paper top is added to represent a canvas tarpaulin. The boat measures 3" long, ¾" wide and ⅝" deep. The anchor should be purchased. It is of the kedge type about 1⅜" long. The bits are carved from ⅛" square bass wood, and stand ¼" high. Their positions are given on the plan. The forward mast is 10⅛" high with a slight rake aft

[*Continued on page* 150]

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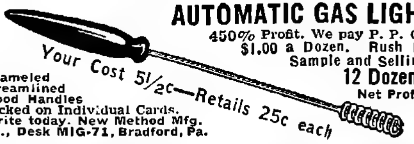

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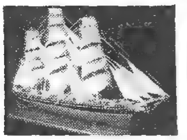

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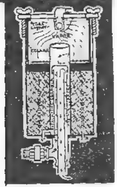

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Build U. S. Coast Guard Boat

[*Continued from page* 149]

and is made in two sections from dowels ¼" in diameter, and 1/16" in diameter. Taper the lower part slightly, and bring the upper part to a gradual point. The crowsnest is a ¼" dowel, ¾" long, glued to the mast where the two sections meet. The rear mast is ⅛" dowel, and is not tapered. It is 3" high, and is glued into a hole in the rear deck house. The cross-trees as well as the boom that goes over the life-boat may be shaped from 1/16" dowel. Sandpaper them well and taper slightly towards the tip. Black thread is used for the rigging and 12 glass beads simulate the aerial insulators.

The searchlight is cut from a short length of ⅜" diameter dowel and is ½" long. When it is assembled it is ¾" high. Deck hatches, two of them, are made of cardboard to the dimensions given on the plan. The hatch behind the main house is built up in three parts, the top, the bottom and center. The other is a square piece of cardboard glued to the deck. Mount a cowl vent on it as shown. There is a small piece of square cardboard beneath the forward gun. This piece is ¾" square and is left unpainted.

The running-lights on the top of the pilot house are made in one piece of cardboard bent and glued together. They are ⅞" long, 3/16" high and ¼" wide.

There are four supports, or stanchions, of 1/16" bamboo that go beneath the bridge. Cut them off to the correct length and glue them in place. They are about 1" long. Do the same to the other bamboo braces that support the davit on the bow. The davit may be fashioned from a wire nail or bent from a length of ⅛" reed.

There is a double hatch immediately before the pilot house. The hatch is built up of separate sections of cardboard. The plan gives the size and position of the parts. Add a door to the rear of the pilot house. It is cardboard 1¾" high, and ½" wide. Border it with black paint or ink to simulate panels. It is glued to the left side, looking forward.

Three 00 Gauge Model Cars

[*Continued from page* 134]

The window sash strips are cut from thin cardboard. These strips are cut ¼" shorter than the sides less the width of the doors. One strip is ½" wide and the other 5/16" wide. Glue or cement them in place so that the right amount shows to form the sash in the window opening. Now cut a strip wide enough to fit between the strips already in place. Cut this into short lengths to form the sides of the sashes. The letterboard is a strip of thin card glued in place over the windows. The beltrail is a 1/16" strip of the same card and extends just to the doors.

Aluminum casting for the ventilators on the

Pullman can be purchased or they can be carved from wood and glued in place. Note that they are not evenly spaced and are not opposite each other. The small screens on the roof between the ventilators show where the ventilators are located on the opposite side, because there is a screen for every vent. The screens can be small pieces of thin card glued in place.

Now round the ends of the roof with a rasp and sandpaper until a smooth curve is obtained. The drips over the doors are cut from thin card. The doors are also thin card and have 1/8" excess on one side. Glue this to the back of the car side the same as the sash strips. Paint the edges of the window frames and sash strips before assembling because it would be difficult to do later when the celluloid is in place.

Get some clear celluloid and cut it to the same shape as the completed side. Place this on the body and pin the car side and celluloid in place. When pinning the side in place, clip the heads from the pins and tap in the pin until the end is flush with the car side. The hammering on the headless end of the pin will form enough of a burr to hold the side securely. Now give the car a coat of primer and set aside to dry.

Form the necessary handrails from thin brass wire, punch small holes for them and cement in place.

The underframe of the car is made from 1/4" square pine, properly tapered at the ends or an aluminum casting can be used. The various boxes and tanks are pieces of wood cut to the dimensions shown on the plans. The steps are castings fastened in place with a screw. The diaphragms can be cast or built up of layers of cardboard and riveted in place on the ends of the car. The couplers are fastened in place with small screws. Be sure the coupler projects pass the diaphragms to couple with another car.

The coach shown is built up in exactly the same way as the Pullman car. On the coach, however, it will be seen that both sides are identical, while on the Pullman they were different. The frosted windows are made by painting the celluloid with diluted white paint. A piece of white cloth cemented behind the celluloid will also be a good substitute. The ventilators on the roof of the coach are turned brass or are built up with small pieces of dowel. If you prefer to use the same type of ventilator as on the Pullman, do so because many of the prototypes have this type. The only difference is, they are smaller and evenly spaced. The number per side varies so you can suit yourself on the number.

The sides are constructed in exactly the same manner as the Pullman sides. Be sure to note the difference in window spacing.

The coach roof section is slightly different from the Pullman roof. Be sure to specify the type when ordering from your model dealer. Parts such as roofs, trucks, ventilators, etc., are purchased so cheaply that it is not worth the time

[*Continued on page* 152]

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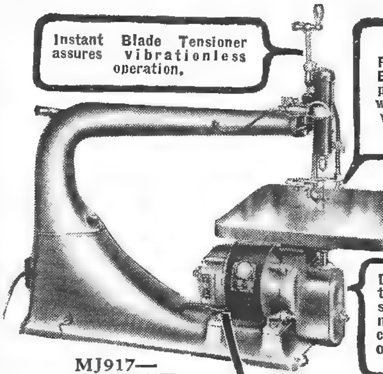

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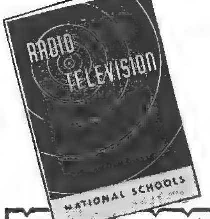

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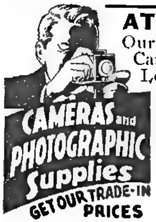

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Three 00 Gauge Model Cars

[*Continued from page* 151]

involved in making your own although you can.

The baggage car is the easiest of the three cars to model, because of the absence of windows, steps, etc. We start this car, as the others, with the floor, which is 9⅜" long. The roof of this car is rounded, as can be seen on the plans. The coach type roof can also be used if desired. It is the older type of roof, the rounded one, seen more often on the newer cars.

The ends of the car are two lengths of flooring cut to the right size. The end sills and door frames are nailed and glued to the ends. The sides are double thickness, the false side and the finished side that you see. The false side can be 1/16" bass wood or heavy cardboard. The finished sides are cut from 5-ply Bristol. Nail and glue the false sides to the body. Of course the door openings must be cut in the false side and the finished side. The doors are made of two layers of thin card. The first layer forms the door proper, while the second layer forms the panels and windows.

Cement the doors in place and then put on the finished sides. Place the pins so that they will be covered by the narrow panel strips seen in the plans. It is not necessary to glaze the door windows as they are so small it would scarcely be noticed. The letterboard around the edge of the roof is made of thin card cemented in place as are the narrow panel strips. Five turned brass or wood ventilators are set in the roof as shown. The handrails and steps are all bent from thin brass wire pushed into holes in the body, a touch of cement will secure them. Notice that the roof overhangs the end of the car. The end moulding, which is a continuation of the letterboards, must be cut in a curve to fit properly. The ends are carefully rounded with a rasp and sandpaper. Some baggage cars have diaphragms, some do not. Once more it is a case of "suit yourself." When placing the grabirons in the end sills, be sure to drill holes first as the thin wood might split.

The trucks of these three cars can be bought from your dealer or built up. Because of their low cost, their construction will not be described here. The Pullman car uses 6-wheel trucks while the coach and baggage cars use 4-wheel trucks.

Upon the next part of the work, the painting, depends in a large measure the success or failure of the entire job. A sloppy paint job can make the finest model look like so much scrap lumber. Be sure there is no grease or oil on any of the parts as the primer will not stick to a dirty surface. Rub the metal parts with naptha or gasoline to clean them. Be sure to do this in a well ventilated room as vaporized gasoline likes nothing better than a stray spark to produce an explosion.

Cut a strip of paper very slightly wider than the height of the windows and insert it behind the finished side so that it covers the celluloid. This

[*Continued on page* 154]

Is Your Drinking Water Pure?

[*Continued from page* 136]

phthalein indicator to the second test tube. If this turns red, an alkali is present. If these indicators are not at hand, litmus papers may be used but they are not quite so sensitive to acid or base.

The remaining two portions are tested for ammonia and for nitrous acid. Nessler's reagent is used for the test for ammonia. Prepare it by dissolving in 20 cc of water, 7 grams of potassium iodide. Then dissolve 3.2 grams of bichloride of mercury in 60 cc of water. When dissolved, slowly mix the two solutions until the precipitate first formed remains undissolved on shaking. Then add 100 cc of water in which 50 grams of potassium hydroxide has been dissolved. After filtering it is poured into an amber bottle and it is then ready to use. This solution must be kept away from the light because light decomposes the reagent; that is why amber colored bottles are used. Pour a few drops of the Nessler's reagent into the test tube. A brown precipitate is formed if ammonia or salts of ammonia are present.

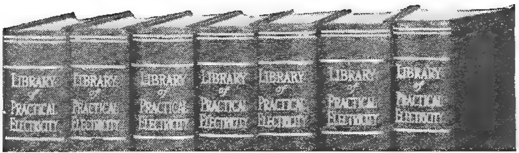
Nitrous acid is tested for by dissolving a small crystal of diphenylamine in a few drops of concentrated sulphuric acid. Then pour this test reagent into the remaining test tube. Heat gently if no blue color develops. The absence of the blue color shows that no nitrous acid is present.

Concentrate the remaining water to about one-fourth of its bulk by evaporating it down. Then test for the other injurious salts in the water. First sodium chloride is detected. Almost all waters contain it and it is not injurious provided not too much is present. The addition of silver nitrate dissolved in water, to a small portion of the water to be tested made slightly acid with nitric acid, gives a precipitate of white silver chloride which turns dark on exposure to light. This test also shows the presence of chlorine.

The sulphate radical of the sulphate of lime is detected by adding a few drops of hydrochloric acid and then a solution of barium chloride in water. Any sulphate gives a precipitate. The lime can be detected by adding a few drops of ammonium carbonate to the test solution and then adding ammonium oxalate. A white crystalline precipitate is formed if lime is present.

The phosphate can be detected by evaporating about one or two ounces of the test solution almost to dryness. Then add a few drops of dilute nitric acid and filter if not clear. Add ammonium molybdate solution and warm the test tube slightly to about 50 degrees C. (122 F.) If a yellow precipitate is formed phosphates are present.

Any of the above chemicals present in the water in large amounts makes that water unfit for drinking purposes. Quite a number of wells do contain such chemicals, especially if they are located near stables, barns or out-houses in country districts. Ordinary piped city water is free of all impurities and never contains salts or chemicals injurious to health.



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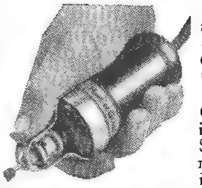

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The Mummy Cloth Mystery

[*Continued from page* 143]

This treatment removes the hurds—they contain approximately 50 percent cellulose invaluable for plastics and when purified useful as alpha cellulose—from the ramie stalks and deposits them at the base of the machine, whence an electric conveyor transports them to an elevated pulverizer which converts the by-product into cellulosic flour. This material now has a market value of $30 a ton. One ton of cured or dried ramie yields from 300 to 350 pounds of fibre, 1,500 pounds of cellulosic flour, and 150 to 200 pounds of waste which may be used in mulching new plant growth.

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Hail From Heaven

[*Continued from page* 137]

total of $12,000,000. Wheat crop losses in Montana in heavy hail years sometimes run as high as 15 per cent of the total state crop and government statistics for Iowa over a 14-year period are well over $50,000,000.

How the heart of a hailstone is formed and its alternate layers of snow and ice built up is explained by Flora as follows: Such raindrops as the updraft within the cloud blows into freezing temperatures quickly congeal and also gather coatings of snow and frost. After the first freezing, the immature hailstone may get into a weaker uprush of air or tumble to the edge of the ascending column. In either event, it then drops into the region of liquid drops where it gathers a layer of water of which a portion is frozen at once because of the low temperature of the kernel and with the aid of an air current it is again carried into the freezing stratum. Here the water on it freezes and becomes sprinkled with snow—another ring. The process is repeated until finally the stone is sufficiently heavy to overcome the rising action and falls against it to the ground.

Three 00 Gauge Model Cars

[*Continued from page* 152]

will prevent the paint from smearing it. Give the car a coat of your favorite metal primer. When this is dry, rub the car lightly with fine steel wool to remove any specks of dust, etc., that might have settled on the wet primer. Paint the cars with your favorite colors. The author used Pullman Green with gold lettering, but other combinations can be used. The New Haven uses blue with silver letters. For the final finish use a good grade of flat varnish. This will protect the paint and keep fingermarks off.

You are now ready to couple the "varnish cars" behind Midget Mike and "highball" down the main line to the various stations along the route.

Six-Man Football

[*Continued from page* 39]

shoes. We won 30 to 13. I have always credited those sneakers with the victory.

Now I have pointed out just where the Sixers' game differs from the regulation one. Remember that the fundamentals are the same, that blocking and tackling, passing and punting must of necessity be learned and perfected, the same as in the larger game.

But the basic activities must be learned better than in the big brother contests. Tackling, for instance, must be cleaner. More of them will be in the open, and cases where a carrier is stopped by general congestion in the line of scrimmage will be extremely rare.

On page 39 you will notice three play formations, which are simple enough and will suggest many other possible attacks to any boy with a quarterback complex.

After a few wide-open plays function perfectly in the field you and your "Sixer" teammates will probably sing the praises of Stephen Epler, the Nebraskan who thought the game up and promoted it, in 1934.

And so I give you the "Sixer" game and I know you will like it. Perhaps, in time, colleges will promote such contests to give a chance for fast track stars and basketball luminaries to participate—and still not seriously risk their valuable legs. What a thrill such a game would be!

Velvet
PIPE AND CIGARETTE TOBACCO
LIGGETT & MYERS TOBACCO CO.

"How about another helping of that good VELVET tobacco!"

Velvet
—the MILDNESS of fine old Kentucky Burley aged in wood
—the FLAVOR of pure maple sugar for extra good taste

Velvet packs easy in a pipe
Rolls smooth in a cigarette
Draws right in both

Better smoking tobacco

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Liggett & Myers
Tobacco Co.

PRINTED IN U.S.A.

A "First-Row Seat"
AT 3,000 AUCTIONS

WITNESSED STATEMENT SERIES: Otis Rucker—independent auctioneer—has smoked Luckies for 21 years

LUCKY STRIKE
"IT'S TOASTED"
CIGARETTES
20
LUCKY STRIKE
Easy on Your Throat—
Because "IT'S TOASTED"

OTIS RUCKER, Independent Expert Since 1909, says: "I Smoke Luckies Because They Buy Fine Tobacco"

"I've been an auctioneer and warehouseman since 1909," says this typical expert. "I started smoking Luckies when they were introduced in 1917. The finest tobacco goes into them. Most of my friends in the tobacco business smoke them, too."

Sworn records show, in fact, that among *independent* buyers, auctioneers and warehousemen, Luckies have *twice* as many exclusive smokers as have all other cigarettes combined.

Yes, Luckies give you the finest tobacco. And they are *kind* to your throat! Their exclusive "Toasting" process takes out certain harsh irritants found in *all* tobacco. Try Luckies for a week.

Copyright 1939, The American Tobacco Company

Sworn Records Show That—WITH MEN WHO KNOW TOBACCO BEST—IT'S LUCKIES 2 TO 1

Double Page Spreads

BE A RADIO EXPERT

MANY MAKE $30, $50, $75 A WEEK

Read How I Train You at Home Mail the Coupon Below

HERE'S PROOF THAT MY TRAINING PAYS

[illegible]

[illegible] a Week in Spare Time

[illegible]

[illegible]

[illegible] a Month in Own Business

[illegible]

Serviceman for Three Stores

[illegible]

Radio [illegible]

Get Ready Now for Jobs Like These

[illegible]

Why Many Radio Experts Make $30, $50, $75 a Week

[illegible]

Many Make $5, $10, $15 a Week Extra in Spare Time While Learning

[illegible]

THE TESTED WAY TO BETTER PAY

BROADCAST STATIONS [illegible]

I Also Give You This Professional Servicing Instrument

[illegible]

LOUD SPEAKER SYSTEMS [illegible]

AUTOMOBILE RADIO [illegible]

Find Out What Radio Offers You

[illegible]

J. E. SMITH, President
Dept. [illegible] National Radio Institute
Washington, D. C.

THIS FREE BOOK HAS HELPED HUNDREDS OF MEN MAKE MORE MONEY
RICH REWARDS IN RADIO

Mail this to get 64 page Book FREE

J. E. SMITH, President, Dept. [illegible]
National Radio Institute, Washington, D. C.
[illegible] Smith: [illegible] obligating me, send "Rich Rewards in Radio," [illegible] opportunities in Radio and [illegible] method of training men at home in spare time [illegible] Radio [illegible] (Please Write Plainly.)

NAME ______ AGE ______

ADDRESS ______

CITY ______ STATE ______

I Risk My Neck For A Thrill

by Al (Flash) Williams

Twelve years as a thrill driver hasn't dimmed the daredevil spirit of Flash Williams, [illegible] America's ace stunt man who tells what it's like to crash a speeding car or plane.

HOW would you like to drive an automobile through a burning house? Or sit at the wheel while your car, traveling at [illegible] miles an hour, hits another car going at the same speed in a head-on collision? Or maybe [illegible] this sounds too tame and instead you would prefer to drive a car at full speed over an elevated platform and then shoot through the air for a distance of 85 feet.

These are everyday experiences for me. For about [illegible] years I've been risking my neck doing almost every dangerous stunt [illegible] with automobiles, airplanes and motorcycles. [illegible] I started [illegible] racing with death at a state fair in Texas in 19[illegible]. I've been a [illegible] and I have invented practically every one of the extra-[illegible] automobile and motorcycle crash stunts.

When I'm not doubling for a [illegible] crashing a plane for the films or performing some [illegible] spectacular feat for the silver screen, I'm likely to be found touring the [illegible] with my troupe of 8 "Thrill Drivers." Most of my [illegible] traveling at [illegible] 75 miles an hour over raised platforms known as ramps. The ramps we originally used were 12 feet long and [illegible] feet high. Now they're 24 feet long and 3[illegible] [illegible] jumping [illegible] high as they used to be. Which means of course that my gang [illegible] about twice as fast and as far as in the old days [illegible] work is doubly dangerous. Many a time [illegible] has made my [illegible] car jump with the aid of [illegible] type of ramp as far as 85 feet [illegible] I claim this is the world's record.

My newest and most spectacular stunt is the "race with death." First [illegible] cars going [illegible] about six [illegible] the [illegible] Now [illegible] the one car [illegible] speed the other [illegible] the ramp. This [illegible] spectacular leap from [illegible] a fraction of a second—means a serious crash. But fortunately there has not been the slightest of accidents while performing this feat.

Probably the most dangerous show we ever [illegible] was the "eight man jump," which we performed regularly several years ago. Eight members of my crew would stretch out [illegible] the ramp and then I would drive over the platform, my car clearing the entire crew [illegible] car performed a sudden swerve and struck [illegible] Since [illegible] the stunt has been abandoned.

Today, I'm especially fond of doing a new stunt called the "moon dip." In this I drive my car at 6[illegible] miles an hour over two ramps. This doesn't sound especially dangerous until you bear in mind that I run [illegible] over as possible on two wheels without actually turning it over. Incredible as it may sound, I'm moving at a 45 degree angle.

I achieve this stunt by practice, but never outside of actual performing hours. I have one peculiar habit—I never rehearse a stunt. Instead I figure it out ahead of time with the most precise accuracy [illegible] works [illegible] my fingers crossed [illegible] show.

One of my best known [illegible] I was speeding at [illegible] miles an hour [illegible] made my car [illegible] with the assistance of a large ramp [illegible] doing this stunt [illegible] for the very good reason [illegible] years an

Opposite page: This spectacular stunt almost proved fatal to "Flash" Williams when he leaped [illegible] the car [illegible]. Below: Driving through a burning house [illegible] is a big stunt [illegible] for "Flash." Once his clothes caught fire and firemen saved him from [illegible]

This is the [illegible] of Flash's most spectacular stunt in which he drives a car off a ramp at terrific speed, [illegible] zooming down [illegible] he landed 55 feet into the river. Flash was thrown through the windshield.

automobile to pieces. And [illegible] too tough on the pocketbook. [illegible] crash cars are [illegible] machines [illegible] equipment of any kind.

My greatest [illegible] I'll never forget the "Return from [illegible]" I used to perform [illegible] several [illegible] stage [illegible] barnstorming a state fair. But I gave [illegible] Way." We [illegible] the town of Big Springs, Texas, in the southwestern [illegible], we built a small "house" for stunting purposes. An automobile was placed [illegible] and I was handcuffed to the wheel [illegible] Thus I was unable to drive [illegible] I was just [illegible] We [illegible] boarded up the structure, pouring 25 gallons of gasoline over it, and set it afire. This [illegible] was back in the days when car bodies were wooden and therefore highly inflammable. I [illegible] the stunt. The house [illegible] up in an enormous flame [illegible] and was [illegible] then suddenly the motor died. [illegible] flames had [illegible] up the carburetor, keeping [illegible] There I was trapped. Luckily the sheriff saw my [illegible] the local fire department [illegible] the rescue. He unlocked the handcuffs and I was able to get out only slightly burned. Do you blame [illegible] again?"

Another close call that was in Fort Wayne, Indiana, back in 1935 [illegible] Flaming [illegible] Wall Crash." I had a new assistant [illegible] show. He [illegible] throwing gasoline from a bucket onto flames in order to give the stunt a more spectacular appearance during the crash.

We [illegible] agreed to his suggestion, but instead of throwing the gasoline [illegible] while I was speeding through the wall he [illegible] in my car. And was I burned! [illegible] scorched [illegible] arms [illegible] legs and singed [illegible] the hair off my head. Fortunately these weren't second degree burns. But they were exceedingly painful [illegible] A [illegible] ambulance was rushed [illegible] the scene and I was scooted off to the nearest hospital. But [illegible] the show.

[illegible] the Hurst [illegible] state [illegible] a [illegible] ago. This was [illegible] car [illegible] head-on [illegible] between my car and the [illegible] my brother Moe was [illegible] The big idea was for both [illegible] jump [illegible]

[illegible] the [illegible] be [illegible] crashed [illegible] crash [illegible] ex[illegible] [illegible] scheme [illegible] but [illegible] the [illegible] right moment and [illegible] My [illegible] head [illegible] on the left [illegible] A [illegible]

[illegible] suggestion.

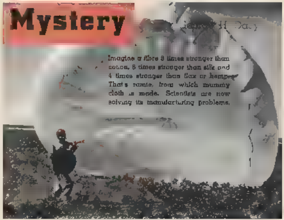
Some [illegible] I [illegible] Or [illegible] a [illegible] miraculous speeding from [illegible] death during [illegible] I drove a car off a raised platform on the [illegible] St. Joseph River [illegible] and hurtled through the [illegible] feet [illegible] the water. Striking the water at this high speed is almost as risky as crashing [illegible] hard ground. The [illegible] washed me clear [illegible] the [illegible] A [illegible]

(Continued on page [illegible])

This is Flash's version of the motorcycle broad jump in which he leaps a [illegible] feet [illegible]

The Mummy Cloth Mystery

[illegible] H. Day



Imagine a fibre 8 times stronger than cotton, 8 times stronger than silk and 4 times stronger than flax or hemp. That's ramie, from which mummy cloth is made. Scientists are now solving its manufacturing problems.

Parachutes made of ramie, which will be [illegible] times stronger and [illegible] as heavy as the present silk [illegible]. [illegible] photo

IT PUZZLED science for 58 centuries. The Pharaohs knew its secret: they grew the ramie plant and made ropes and mummy cloth from its fibre. The Orientals—Asiatic nomads, followers of Confucius and Genghis Khan—harvested the ramie plant, separated the fibres from the stalk and wove beautiful textured cloth, made ropes and mats, wall coverings and decorations. They did this work by hand—slowly and laboriously. They knew it by various names in different lands: called it iron-cloth, rhea, China grass, glass-cloth, kari-mushi and tsut-ma. For 58 centuries it baffled time's attack.

But today ramie, the oldest known textile fibre, is on the brink of succumbing to mechanization. Scientists and engineers have at last cracked the secret of its manufacture and machines that separate the fibre from the stalk and weave it for commercial use are already in operation.

Ramie is the most durable, strongest and lightest vegetable textile material extant. It is 8½ times stronger than cotton, 8 times stronger than silk and 4 times stronger than flax or hemp. It is less crushable than linen and so durable that the average business man will be unable to wear out a suit made from ramie (or mummy) cloth. It is claimed that future parachutes made of this material will be 8 times stronger but will weigh half as much as the best material now in use. These improved chutes will neither mildew nor rot and may be packed in storage indefinitely without danger of deterioration. Similarly potential airplane cloth will weigh less and last longer. Industrial belts—made of ramie fibre—90 percent are now manufactured of cotton impregnated in rubber—will neither stretch nor shrink. Ropes, fish lines, nets and sails of ramie will withstand from 75 to 100 years of the hardest wear and tear.

Charles R. Dodge, former special agent of the U. S. Department of Agriculture, writes that ramie has three times the strength of Russian hemp, while its filaments can be separated almost to the fineness of silk. It may be spun in various textile machines and is used in association with cotton, wool and silk in spinning, being an excellent substitute in certain manufacture for all of these textiles as well as [illegible] flax where great elastic is not essential. It produces superior paper and is used for banknote paper because of the fineness of its pulp. The fibre may be dyed in all desirable colors and used for tablecloths, napkins, plushes, upholstery, curtains, carpets, dress and knit goods.

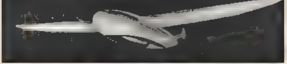
Dr. G. L. Carter, fellow in the Institute of Research of Louisiana State University, and Dr. P. M. Horton, assistant director of the Institute, in a jointly published paper on ramie, issued in 1936, pointed out that because of the high tensile

Left—A ramie field at [illegible] experimental farm at Live Oak, Fla. Above—The fully grown plant is 7 ft. high [illegible]

Left—Ramie [illegible] like sheep's wool. As [illegible] it is cooler than [illegible] less crushable than [illegible]

WIN AN AIRLINE TRIP To Hollywood

In MI's Nation-Wide "Men With Wings" Contest



Men With Wings provides a glimpse into the future when giant aircraft like the proposed 100-passenger Sikorsky flying boat above will be commonplace. Right—A thrilling World War air battle scene from the motion picture.

HOW would you like to win a free round-trip flight on one of America's leading airlines to Hollywood, California, where you will meet some of the famous motion picture stars, be escorted through the Paramount Pictures studios, and be taken on a tour of the Douglas Aircraft Company in Santa Monica where the huge DC-4 42-passenger airliners are constructed? Well, this four-place treat is first prize in the "Men With Wings" Contest being sponsored by MECHANIX ILLUSTRATED and Paramount Pictures and you have just as much chance to win it or the twenty-five other excellent prizes which will be awarded, as anyone else. There are no frills to this contest, nothing difficult or "tricky." All that is required is that you answer ten simple aviation questions as listed on the next page and write a 25- to 50-word letter.

The ten questions are based on historical aviation facts which are shown, or referred to, in Paramount Pictures' new production "Men With Wings", the first all-Technicolor aviation motion picture ever filmed, starring Fred MacMurray, Ray Milland and Louise Campbell, and directed by William Wellman. Of course since the questions are based on actual facts, you can look up the answers in standard reference books but it won't be half as much fun as seeing the picture at your local theater and learning the answers from its thrilling and colorful scenes.

Starting with the first successful flight of the Wright brothers, the picture portrays in a stirring story form the progress of aviation from the days of bamboo and baling-wire structures to the sleek-looking, all-metal "flying fortresses" of today. In fact, the story takes us a step further, providing a glimpse of aviation of the future. Throughout the picture there are thrills galore—crashes and struggles of the early pioneers, sky battles of the World War days, [illegible] Atlantic flight, [illegible] Technicolor.

This thrilling motion picture recalls the feats of such famous flyers as Bleriot, first man to fly the English Channel; Alcock and Brown, first men to fly across the Atlantic; Lindbergh, first man to fly solo across the Atlantic; Wiley Post, first man to fly solo around the globe, thus helping you to choose a subject for your letter on "Who is Aviation's Greatest Hero?" as required in the rules given on this page. Of course you may also choose Douglas, Martin, Seversky or some other famous aircraft designer as [illegible].

(Continued on page 142)

Top—Paramount's new all-Technicolor production, *Men With Wings*, stars Fred MacMurray, Ray Milland and pretty Louise Campbell. The picture shows in thrilling story form, the progress of aviation as typified by the planes at right and above, showing the first and latest U. S. Army airplanes.

CHECK ONE SQUARE FOR EACH QUESTION

1. The first successful airplane flight was made by the Wrights on December 17, 1903 ☐ December [illegible] ☐
2. The United States Army had no airplanes before the World War. Yes ☐ No ☐
3. When Alcock and Brown made the first successful flight across the Atlantic Ocean they landed in Long Island ☐ Newfoundland ☐
4. Colonel Charles Lindbergh started his famous trans-Atlantic flight from Orchard Beach, Maine ☐ Curtiss Field, L. I. ☐
5. The name of Colonel Lindbergh's monoplane was Winnie Mae ☐ Spirit of St. Louis ☐ Old Glory ☐
6. The early pioneers were more interested in the development of the airplane as a means of transportation than in its possible value as a weapon of war. Yes ☐ No ☐
7. The first scheduled air mail planes were flown by U. S. Army pilots. Yes ☐ No ☐
8. Commercial pilots must first serve as test pilots. Yes ☐ No ☐
9. Corrigan flew to Ireland with the aid of a "gyro-pilot" and other modern direction-finding instruments. Yes ☐ No ☐
10. Wing flaps were invented to make an airplane fly faster. Yes ☐ No ☐

Name and Address

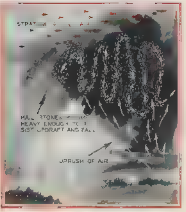
Age

After checking off your answers to the above questions, tear out this coupon, or make a copy of it, and send it together with your 25 to 50 word letter on the subject—"Who Is Aviation's Greatest Hero?" to Contest Editor, MECHANIX ILLUSTRATED, [illegible] Broadway, New York, N. Y.

HAIL FROM HEAVEN

This story is about hailstones as big as tennis balls that fall from heaven in the world's worst storms.

by J. McQueeny


STRAT[illegible]
HAILSTONES [illegible] HEAVY ENOUGH TO RESIST UPDRAFT AND FALL
UPRUSH OF AIR

Above, [illegible] thrice the size of eggs [illegible] in Illinois in [illegible]. Below: Hail caused considerable property damage in this [illegible] shown. The drawing illustrates [illegible] upward [illegible] carried into the atmosphere and freezes. [illegible] carried up again where it [illegible] another [illegible] until [illegible] weight [illegible]. Pictures on the opposite page show [illegible] Baltimore storm in May [illegible] a car trapped in a deep drift during a storm in Omaha, Neb., May, 1936.

HOW would you like a hailstone as big as a baseball to whack you on the head? Or would you prefer the experience of having a shower of hailstones three times the size of eggs come crashing through the roof of your car or home? This is not mere conjecture. It has actually happened. All the records of hailstorms [illegible] hails have been more or less common. Likewise, there have been a few cases where they might have been mistaken for baseballs, and in at least two cases pieces of ice chunks having fallen from the heavens were comparable to grapefruit. For the largest apparently authenticated single hailstone, S. D. Flora, [illegible] Kansas [illegible] fell at a house in Heidgraben, Germany, on August [illegible] 1925. It measured [illegible] inches and caused such a flurry of excitement that no one had presence of mind to weigh it.

Coming closer to home, the hail authority says, "the stone that fell at Potter, Nebraska, July 6, 1928, [illegible] American history [illegible] It measured 17 inches and weighed 1½ pounds. In my judgment it was bigger than the whoppers that are said to have fallen in New South Wales almost a century ago and the pick of India's famous storms, none of which ever produced hailstones more than 12 inches in circumference."

Sworn statements and photographs can be shown in support of the size of the Nebraska hailstone and Flora does [illegible] them.

A peculiar hissing noise [illegible] as a prelude to the first hailstones, which were the size of hen's eggs. Larger and larger they grew until they [illegible]. Many of these were [illegible] and their weights ranged from [illegible]. Eyewitnesses [illegible]

[Continued on page 137]

The Amateur Guncraftsman

By James V. Howe

MI's Book-of-the-Month

The [illegible] of the metal parts [illegible] spend them [illegible] in the polishing done before the bluing.

Simplified Bluing Methods

THE essential object of bluing is to dull the bright steel color of the barrel and action or other exposed metal parts of firearms. The process does not entirely prevent the metal from rusting, but steel thus treated [illegible] attacked by rust as if it were [illegible] tion. A well-blued firearm also is more pleasing to the eye. Bluing, in short, is the dressing-up process for the metal parts of a firearm, just as paint is the means of making homes and motor cars more attractive, gas stations more inviting, and the ladies, bless their hearts, more alluring provided too much is not used. But it will do your gun no good if the essential parts are not thoroughly polished before the b[illegible] solutions are applied. The [illegible] degree of polish secured bef[illegible] bluing solution.

A wooden holder is a great help in holding the emery cloth while polishing length[illegible] on the barrel, this or other parts being held in the vise protected by hardwood, [illegible]

[illegible] arms upon the cylindrical surface. It is very efficient in removing the tool marks and other irregular spots often found on a barrel when it has been machined even with a fine feed on the lathe. It is always well to keep the file chalked on both sides. Every time it is [illegible]ked free of chips, the surface should be gone over again with cha[lk].

Draw-polishing with emery cloth is very similar to draw-filing, except that emery cloth is used in the medium and finer grades to complete the polish of the metal parts before the bluing takes place. By making a holder of hard wood, much better results are obtained and the operation becomes more pleasant. The purpose of draw-polishing [illegible] and crocus cloth is to eliminate [a]ll surface scratches completely. After hav[ing] [illegible]e begun to polish, do not lift the [illegible] from the work, but continue with [illegible] length of the barrel [illegible] using the finer grades o[f] [illegible] crocus cloth. Of course [illegible] operations require time and patience, especially on receivers or actions, guards, [illegible] triggers, shotgun actions, floor plates, etc. Revolvers, automatic pistols and their actions demand some ingenuity in order to g[illegible] their odd forms and corners. This is true of the interior parts of other weapons that have to be got at before bluing actually takes place.

BLUING—In this chapter the bluing p[ro]cesses described are only two, and these the guncraftsman should use for all his work. (Only one will be described in this transcript. Editor.) Many other bluing solutions are on the market but the materials for the formulas here given will be found to be most reasonable in cost. For the price of one small bottle of bluing solution, one can often prepare a whole gallon in his own workshop by mixing the ingredients himself. Many gunsmiths throughout the country now practise this economical method. Those who w[ish] to experiment on bluing will find a go[od] number of other formulas in "The Modern Gunsmith." [Also available from the publishers of "The Amateur Guncraftsman."]

MI'S BOOK OF THE MONTH

Every month several new [illegible] books are published which [illegible] are of special interest to readers of MECHANIX ILLUSTRATED. We [illegible] that you may not be able to read them [illegible] plan [illegible] outstanding book of the month and present here an extract from it. The books will be chosen for their special interest in the fields of adventure, travel, [illegible]

Readers who wish to obtain these books to be read in their entirety may order them from their local book dealer [illegible] or the publisher [illegible]

The Amateur Guncraftsman by James V. Howe is our selection for November. The publisher is Funk & Wagnalls Co., 354 Fourth Ave., New York, N. Y. Price $4.00.

Gunsmiths have for hundreds of years racked their brains and consumed buckets of midnight oil trying to devise some method whereby the metal parts of a firearm could be blued merely by immersing the parts in a tank of prepared solution, without much physical labor. I do not wish to conceal the sum total of sublime patience that is usually needed in polishing metal gun parts, but with the No. 1 formula given here some remarkable things can be done. An old rifle or shotgun with the original finish or bluing badly worn can be rebaptized in a tank of this solution, and in ten minutes after its beginning, its outer surface should be free of any signs of sinful [illegible]

Both of the formulas given in this chapter require the following preparations. After the barrel or other metal parts of a firearm have been polished a plug of maple must be made and inserted into the muzzle and another into the chamber end of the barrel to keep the solutions from entering the bore.

If you intend using only the No. 1 formula in the workshop, one tank is all that is necessary, for this formula does not really require any caustic or lye to remove the grease from the metal parts. The bluing problem is here made very simple, and we are of the opinion that No. 1 formula will be the standard for nearly all guncraftsmen using this book.

The bluing [illegible] heater [illegible] gallon [illegible] length [illegible]

The galvanized tank should be made five inches wide and five inches high, the length being governed by the longest barrel or part which is to be blued—42 to 44 inches is very convenient. Each end of the tank should have a good-sized handle for removing i[t] [f]rom the gas stove and for convenience in cleaning.

The No. 1 formula is very easy to prepare. Any guncraftsman can order the chemicals from any wholesale drug company, or from the local druggist, though the latter should not be allowed to charge for them at pre[scrip]tion rates. This bluing formula [illegible] become the standard for the home workshop. It assures a finished job of the best qua[lity], imparting a rich, lustrous, deep blue-black that reminds one of dark satin. The actual bluing of the parts requires only ten minutes to complete after the solution begins to boil, thus the mixture remains after the parts are removed and can be use[d] [illegible] again on other weapons.

[Continued on page 143

MI Readers' Service Bureau

THE MI Readers' Service Bureau was started for the express purpose of making MECHANIX ILLUSTRATED a more valuable magazine for its readers. The editors have felt that too many readers overlook the value of the advertising columns and hence miss many valuable opportunities. After all, advertisers spend thousands of dollars every month on interesting booklets and other literature

MECHANIX ILLUSTRATED censors its advertising stringently for your protection and therefore urges you with full confidence to take advantage of its columns and the many attractive offers made in them

To bring them to your attention and to simplify your obtaining information from the advertisers you select, all the offers made in this issue, with the exception of those in the classified section, are listed on this and the opposite page

WARNING!

Don't fail to examine all advertisements in this issue and the offer they make. We are willing to forward three of your requests for booklets, etc., but don't let this stop you from ordering additional material directly from other advertisers. REMEMBER—read the advertisements carefully.

It is the function of the Readers' Service Bureau to act as a clearing house for both readers and advertisers The listing gives offers made, the cost of each, and a convenient identifying number To simplify the ordering of booklets, samples, catalogs, etc., the bureau will forward your requests to three or less of the firms listed

Merely write your name and address on the coupon, mark the numbers of the offers wanted, and mail the coupon either in an envelope or attached to a post card. The Readers' Service Bureau will do the rest.

If the offer selected is listed as "free," all you have to do is to send in the correctly marked coupon. If there is a slight charge (usually only 3 cents and rarely more than 10 cents to cover the cost of mailing bulky catalogs, booklets or samples), be sure to include correct amount with the coupon, U S. Postage stamps are acceptable.

Offer No.	Firm	Type of Business	Offer Made	Charge	Ad Appears on Page
1	Allied Radio Corporation	Radios	Catalog	Free	141
2	American School	School	Booklet	Free	17-22
3	American School of Photography	School	Booklet	Free	21
4	Charles Atlas	Physical Training	Booklet	Free	144
5	Atlas Press	Tools	Catalog	Free	142
6	Aurora School of Photo Engraving	School	Booklet	Free	18
7	Automatic Water Heater	Water Heater	Plan	Free	24
8	Bass Bargaingrams	Bargaingrams	Barbaingrams	Free	24
9	Bausch & Lomb	Microscopes	Booklet	Free	142
10	Benjamin Air Rifle Co.	Firearms	Specifications and Targets	Free	10
11	Bild-Ur-Own Devices	Scooter Kits Motors	Plans and Book	Free	18
12	Brownscope Co.	Telescopes	Catalog	Free	146
13	Casein Co. of America	Glue	Handbook	Free	134
14	Chicago Technical College	School	Trial Lesson	Free	27
15	Chicago Wheel & Mfg. Co.	Tools	Catalog	Free	153
16	College of Swedish Massage	School	Booklet and Anatomy Chart	Free	20
17	Coyne Electrical School	School	Booklet	Free	14
18	Craftsman Wood Service Co.	Woodworking	Catalog	10 Cents	146
19	J. C. Deagan	Oil Filter	Booklet	Free	150
20	Delta Mfg. Co.	Business Opportunity	Book	10 Cents	16
21	Henry Disston	Saws	Booklet	Free	139
22	Dodge's Institute	Radio	Catalog	Free	26
23	Donley Publishing Co.	Inventions	Booklets	Free	8
24	Ben Dove Garment Co.	Business Opportunity	Outfit	Free	148
25	Dr. Cleveland Dental Laboratory	False Teeth	Booklet & Impression Material	Free	22
26	Engineer Dobe	School	Booklet	Free	20
27	Victor J. Evans & Co.	Books for Inventors	Booklets	Free	9
28	Fireside Industries	School	Booklet	Free	17
29	Franklin Institute	School	Booklet and Lists	Free	18
30	GHQ Motors	Engine Kits	Catalog	3 Cents	140
31	Gilbert Hall of Science	Erectorscope	Catalog	Free	147
32	G. H. Hardt	Potato Chips	Data	Free	24
33	Hemphill Diesel Schools	School	Data & Information	Free	26
34	Hobart Bros.	Welding	Booklet	Free	17-144
35	Institute of Applied Science	Fingerprint Expert	Report	Free	25
36	International Correspondence Schools	School	Booklet	Free	3-10-25
37	International Typewriter Exchange	Typewriters	Literature	Free	26
38	J&H Metal Products Co.	Tools	Catalog	Free	16
39	Kant-Slam Co.	Door Stops	Details	Free	33
40	Kelsey Presses	Printing Presses	Catalog	Free	146
41	L. C. Smith and Corona Typewriters Inc.	Typewriter Co.	Booklet	Free	147
42	L. F. Randolph	Patents	Booklets	Free	8
43	LaSalle Extension University	School	Booklet	Free	5-18
44	Lincoln Airplane and Flying School	School	Information and Booklet	Free	20
45	Lincoln Engineering School	School	Catalog	Free	22
46	McSweeny Trade School	School	Booklet	Free	22
47	Michigan Trade School	School	Folder	Free	26
48	Midwest Radio	Radio	Catalog	Free	26-28
49	Carl Miller	Attorney	Book and Form	Free	138
50	Moon Gag-Cartoon School	School	Trial Lesson	Free	32
51	National Potteries	Pottery	Details Colorplate	Free	24
52	National Poultry	Poultry	Booklet	Free	149
53	National Radio Institute	Radio	Booklet	Free	6-7
54	National Schools	School	Booklet	Free	21-151
55	N. W. School of Taxidermy	School	Booklet	Free	22
56	New York Institute of Photography	School	Booklet	Free	24
57	Clarence A. O'Brien & Hyman Berman	Patents	Booklet	Free	13
58	Oil Burner Co.	Oil Burners	Catalog	Free	148
59	Pan American	School	Booklet	Free	33
60	Plastex Industries	Business Opportunity	Booklet	Free	24
61	Polk's Hobbies	Gas Engine	Catalog	5 Cents	18
62	Porter Chemical Co.	Chemicals	Booklet	Free	138
63	Rand	Hair Grower	Trial Offer	Free	148
64	Raye Burns School	School	Details	Free	26
65	Reclaimo Mfg. Co.	Oil Filter	Booklet	Free	150
66	Rollins Instrument	Drawing Board	Circular	Free	21
67	The Rosicrucians	Psychology	Book	Free	144
68	T. M. Sayman	Soap	Samples	Free	32
69	Silver Mfg. Co.	Radio	Catalog	Free	18
70	C. A. Snow and Co.	Business Opportunity	Booklet	Free	8
71	So-Lo Works	Rubber Molds	List	Free	27
72	South Bend Lathe Works	Machinery	Catalog	Free	34
73	Speedway Mfg.	Tools	Information	Free	150
74	Standard Business Training Institute	School	Booklet	Free	27
75	Thayer & Chandler	Electric Pencil	Catalog	Free	21
76	United Camera Exchange	Cameras	Catalog	Free	152
77	United Mushroom Co.	School	Plan	Free	32
78	U. S. Dental Co.	False Teeth	Catalog Mouth Forms	Free	146
79	Universal Photographers	School	Catalog	Free	152
80	D. Van Nostrand Co. Inc.	Publishers	Catalog	Free	15
81	Washington School of Art	School	Booklet	Free	16
82	Wholesale Radio Service Co. Inc.	Radio	Catalog	Free	20-143
83	Wholesale Radio Corp.	Radio	Catalog	Free	32
84	Wisconsin School of Watch Repairing	School	Information	Free	22
85	Woodstock Typewriter Co.	Typewriters	Literature	Free	32

Readers' Service Bureau
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1501 Broadway, New York, N. Y.
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(Put numbers in squares)

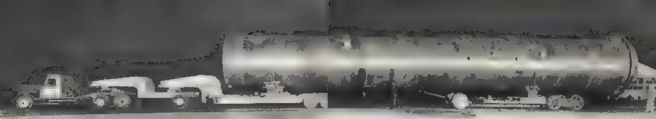
I am enclosing ______ cents in stamps
(Ignore this line if all offers are free)

Name

Address

City and State

Note: This offer expires December 1, 1938. After this date, write directly to advertisers for offers.



Mammoth Highway Trailer Carries 140-Ton Loads

PULLED by a tractor truck powered by a 200 horse- [illegible] equipped with 34 wheels and has carried loads [illegible] trailer is so wide that [illegible] chassis takes up a large share [illegible] road and a special permit covering a specified route must be [illegible] before it can be operated on the highway. Despite its huge size, the trailer is said to handle well at speeds ranging from five to fifty miles [illegible] hour. The photo above, [illegible] across both pages, shows [illegible] 140 tons.

Device Counts Dust

D[illegible] instrument recently developed. Simple in operation, the device can be used satisfactorily by an inexperienced layman.

Farm Cultivator Runs Like Trolley Car

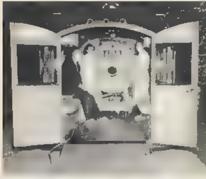
DERIVING its current supply from parallel power lines, 2000 feet long, [illegible] on poles down the center of the farm, a novel electrically-driven cultivator has been [illegible] the power [illegible] as shown in photo.

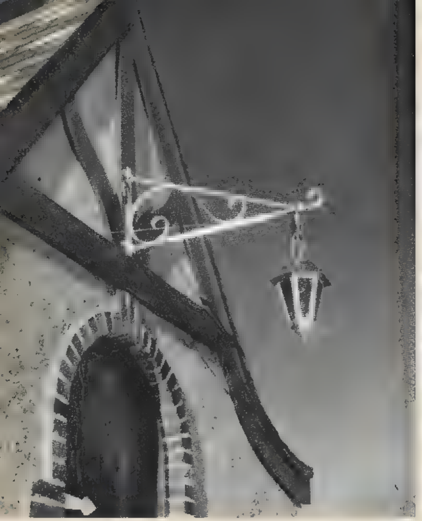
"Iron Lung" Patient Travels In Trailer

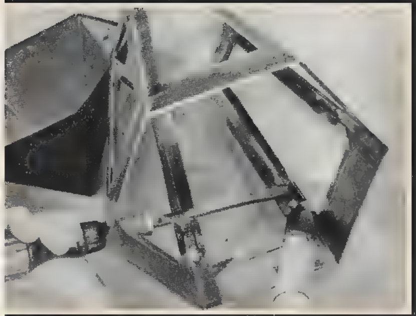
ACCOMMODATING [illegible] which [illegible] has been confined since [illegible] paralysis attack [illegible] special trailer [illegible] enable [illegible]

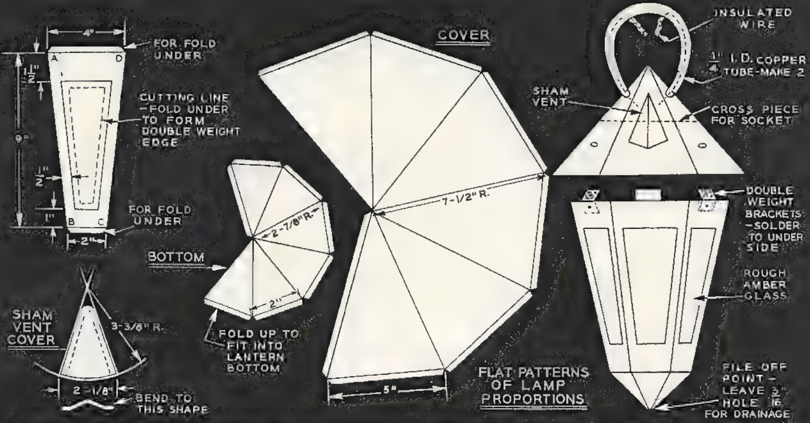
Weatherproof House Siding Developed

MADE [illegible] special [illegible] and has [illegible] appearance [illegible] The [illegible] 9½ inches wide and is said [illegible]





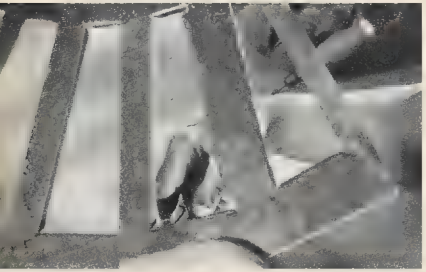



4"
FOR FOLD UNDER
A
D
1 1/2"
CUTTING LINE – FOLD UNDER TO FORM DOUBLE WEIGHT EDGE
9"
1/2"
1"
B
C
FOR FOLD UNDER
2"
COVER
7-1/2" R.
2-7/8" R.
BOTTOM
2"
FOLD UP TO FIT INTO LANTERN BOTTOM
5"
SHAM VENT COVER
3-3/8" R.
2-1/8"
BEND TO THIS SHAPE
FLAT PATTERNS OF LAMP PROPORTIONS
INSULATED WIRE
1/4" I.D. COPPER TUBE-MAKE 2
SHAM VENT
CROSS PIECE FOR SOCKET
DOUBLE WEIGHT BRACKETS – SOLDER TO UNDER SIDE
ROUGH AMBER GLASS
FILE OFF POINT – LEAVE 1/16" HOLE FOR DRAINAGE

COPPER ENTRANCE LANTERN

by Reginald O. Lissaman

A template is used for locating the corners of the cut-out portion of the faces. Any sharp pointed instrument can be used to mark the corners. This work should be done very carefully.



Openings for the glass are cut smaller than the finished size; the edges are turned in as shown in the photograph. Later they are beaten down flat to form a double weight edge.

THIS attractive lantern will lend a welcoming charm to any entrance, and while suggestive of the old world it was not however reproduced from any particular antique. Instead the design was worked out in paper until a pleasing shape was achieved, consistent with economy of material and simplicity of construction. Made entirely of copper, there is nothing to rust or otherwise deteriorate with time, and as may be seen from the illustration, the lamp is well worth making from a decorative viewpoint alone.

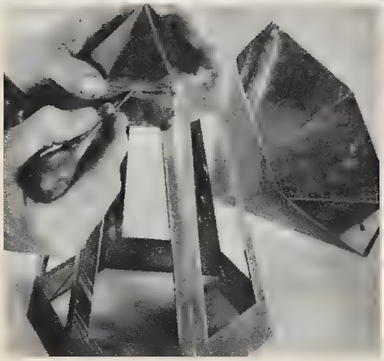
The body of the lantern should be laid out first. A template is made, from the scale drawing, of a single lamp face; from this sheet-metal template a layout of the six sides are drawn on paper. Lay the template on the paper and trace the outline ABDC. Then move the template over till AB of the template falls along and coincides with the line CD just drawn. Repeat this until all six faces are shown, plus a quarter of an inch on one side for the lap joint. This paper pattern is now laid on the sheet copper in such a manner as to cut with the least waste. The pattern is used for this purpose only. The actual layout onto the copper is done with the template, for accuracy. The window openings may at this time be located by prick-punching at the correct points.

The glass openings are cut out with a wood chisel, with the copper being held over the end grain of a block of wood. The openings are cut smaller than finished size, so that the material can be folded back to form a heavier edge. Forming the balance of the body, top and bottom will offer little difficulty, since copper is an easy material to work with. Be sure, however, to save all cutting scraps for forming the sham vent covers, glass clips, and socket support, etc.

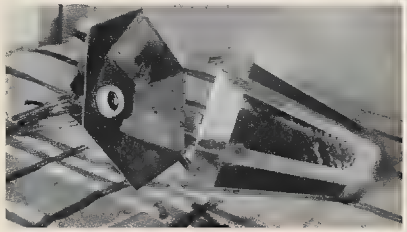
The handle, or rather the hanging rings, are formed from fairly heavy ¼" inside diameter copper tubing, through which passes the insulated wiring. These rings are fixed to the top by passing their ends through holes in the top, flaring the tube end and then soldering. Keep all soldering inside, where it will not show. This is done by sweat soldering all lap seams. Steel wool will clean the desired portions, which are then tinned, and while held in place sweated together. A healthy sized soldering tool will be found necessary, since the sheet copper will conduct the heat away from a small tool before it has done its work.

Three clips are soldered in place for each piece of glass. The angles which connect the body to the top are formed from two-ply of the sheet copper; riveted and soldered to the body, with nuts soldered to the angles for attaching to the top. The cross piece holding the porcelain socket is fixed in the top after all other work on this part is completed, as it will be next to impossible to wire it afterward.

[*Continued on page* 134]



The bottom piece is fitted into the body as shown by the photograph. They are fixed solidly into position by sweat soldering. A tiny hole is left in the end for drainage.



The finished lantern ready for the bulb to be inserted before final assembling. The wiring enters through the rings at top.

Three "00" Gauge Model R. R. Cars

THESE cars were built to go with "Midget Mike," the locomotive described in the March, April and May, 1937 issues of MODERN MECHANIX.

They are models of the shorter type of cars, designed so that they can take short radius curves. The Pullman car shown is of the eight-section type which is shorter than the standard twelve-section car.

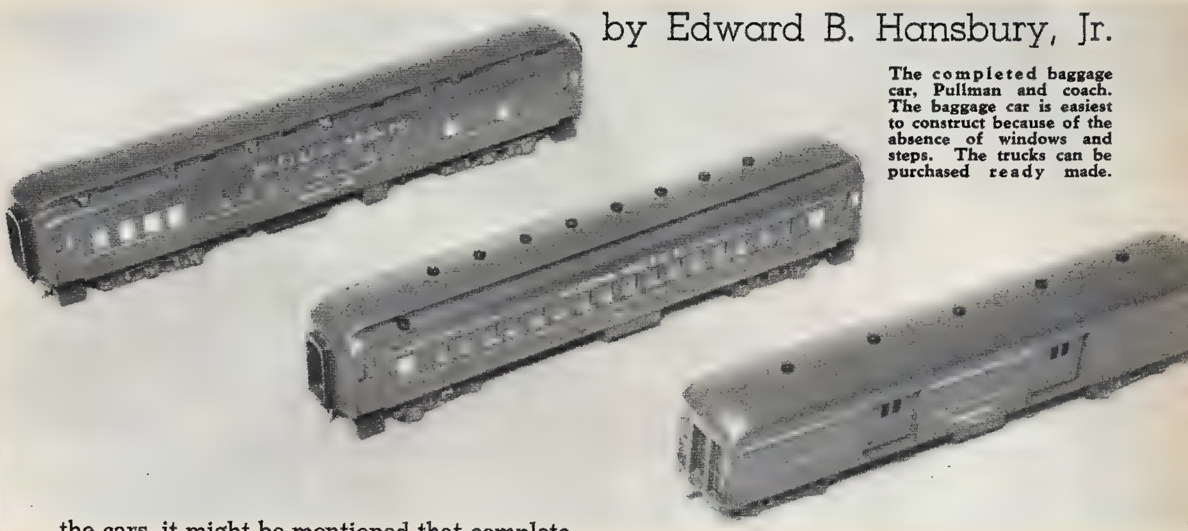
The construction of this car is the same as that of practically every type of passenger car model. Be sure to study the plans carefully and make a mental note of all the details of the sides, roof and underbody. It will be noticed that there are two entirely different sides on the Pullman and the different pieces of underbody equipment match individual sides. The two sides of both the coach and the baggage car are the same. However, be sure to locate the underbody details properly.

When filing, sawing or sanding any parts, it is much better to take off too little than too much, because more can always be taken off, but it is difficult to replace.

When you are cutting out the parts for the cars, it is easy to cut a number of them and build several cars at once.

Before we proceed with the construction of the cars, it might be mentioned that complete kits for these cars can be obtained from your favorite model dealer. In these kits, the sides are stamped brass with the window sashes, letterboard and beltrail formed. The ends are aluminum castings, while the generator, air brake cylinder and steam drips are turned brass. The triple valve, steps, couplers and vents are bronze castings.

by Edward B. Hansbury, Jr.

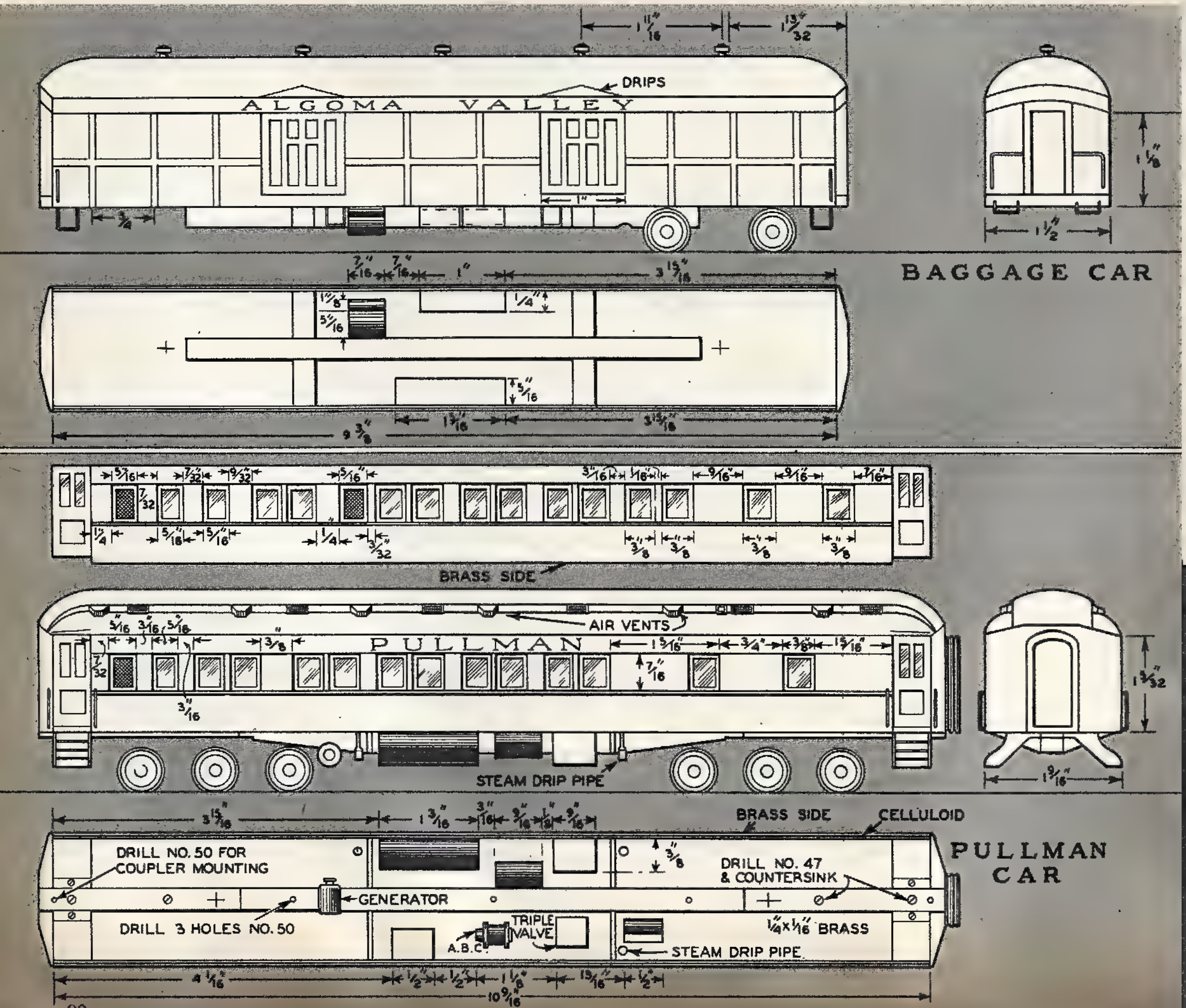


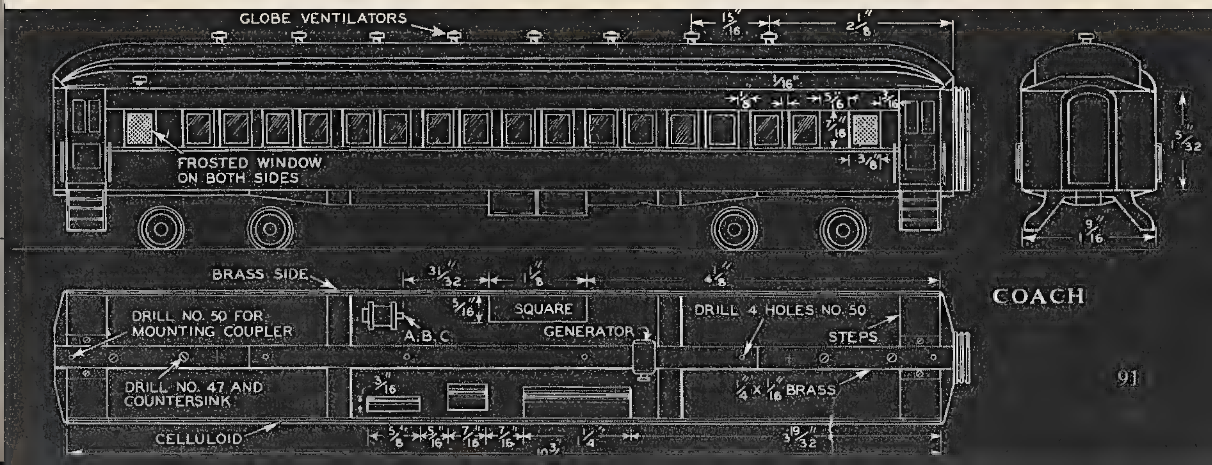
The completed baggage car, Pullman and coach. The baggage car is easiest to construct because of the absence of windows and steps. The trucks can be purchased ready made.

The brass slides of these kits can be shortened by carefully sawing four windows from the center and soldering the ends together.

However, we will proceed by describing how to build the cars from raw materials. The foundation for all the cars is the floor. Secure a piece of straight-grained pine 1⅜″ wide and ¼″ thick. The Pullman floor is 10 9/16″ long. On the underside of the floor, pencil in the outlines of the various details such as air tanks, battery boxes, etc. This will eliminate errors when you finally fasten the parts in place. The roof is a length of standard Pullman roofing, obtained from your dealer. Cut a setback on each end so that the underside section of the roof will be exactly the same length as the floor. The ends can be cast aluminum or a piece of pine shaped as per plans. Nail the floor, roof and ends together.

[*Continued on page* 134]


DRIPS
ALGOMA VALLEY
BAGGAGE CAR
BRASS SIDE
AIR VENTS
PULLMAN
STEAM DRIP PIPE
BRASS SIDE
CELLULOID
DRILL NO. 50 FOR COUPLER MOUNTING
DRILL NO. 47 & COUNTERSINK
GENERATOR
DRILL 3 HOLES NO. 50
TRIPLE VALVE
A.B.C.
¼x1/16 BRASS
STEAM DRIP PIPE
PULLMAN CAR

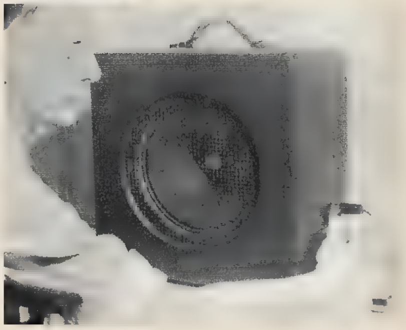

GLOBE VENTILATORS
FROSTED WINDOW ON BOTH SIDES
BRASS SIDE
SQUARE
A.B.C.
GENERATOR
DRILL NO. 50 FOR MOUNTING COUPLER
DRILL 4 HOLES NO. 50
STEPS
DRILL NO. 47 AND COUNTERSINK
¼ X 1/16 BRASS
CELLULOID
COACH

The MI Music Booster

by John H. Potts

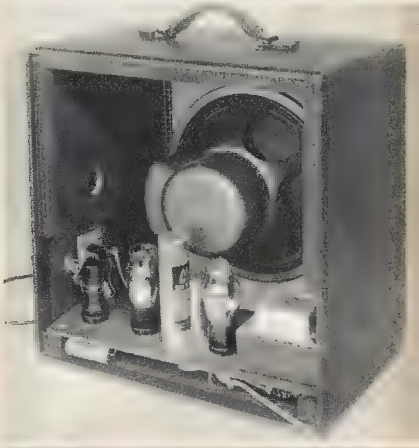
Left—Soft voiced instruments such as violins and guitars are particularly suited for use with the amplifier. As shown in the photograph, the microphone is not easily noticeable when placed in position on the instrument.

Below—A front view of the completed amplifier. The volume control and microphone jack are located on the right side of the carrying case. A wire grille in front of the speaker cone protects it against accidental damage.



Parts List

C1—Aerovox electrolytic condenser, 25 mf., 25 v., type PB25
C2, C3—Aerovox electrolytic condenser, 8-8 mf., 450 v., type 2GLS (both in one can)
C4—Aerovox mica condenser, .01 mf., 1,000 v., type 1,450
C5—Aerovox mica condenser, .02 mf., 1,000 v., type 1,450
C6, C7—Aerovox electrolytic condenser 8-8 mf., 450 v., type 2GL (both in one can)
R1—Carbon resistor, 500,000 ohms, 1 watt
R2—Carbon resistor, 2,500 ohms, 1 watt
R3—Volume control with switch, audio grip taper, 500,000 ohms
R4—Carbon resistor, 200,000 ohms, 1 watt
R5—Carbon resistor, 50,000 ohms, 1 watt
R6—Carbon resistor, 250,000 ohms, 1 watt
R7—Wire-wound resistor, 40,000 ohms, 10 watts
T1—Power transformer, primary 110 v., 60 cy.; sec. 700 to 750 v., c.t., @ 70 to 90 ma.; 5v., 3a.; 6.3 v., 3a., c.t.
T2—Output transformer (supplied with speaker)
Wright-DeCoster 10-inch dynamic loudspeaker, type EIOKU, with tapped field coil and universal output transformer
Amperite Kontak microphone, type SKH, complete with 20-foot shielded cable
Acratone speaker carrying case, 15x15x10, type no. 13789, for single speaker
1—jack, single circuit, for microphone
1—phone plug
1—mounting base for amplifier, wood or metal, 14¼x4 inches
1—piece Celotex for speaker, 12x12x¾ inches
3 tubes (1-80, 1-6B5, 1-6N7)
3 sockets (1-octal, 1-6 prong, 1-4 prong)
Push-back wire, wood and machine screws and nuts



Above—A rear view of the amplifier showing the location of the parts. The power transformer is at the extreme right with the rectifier tube and filter condensers next. Below is the wiring diagram.

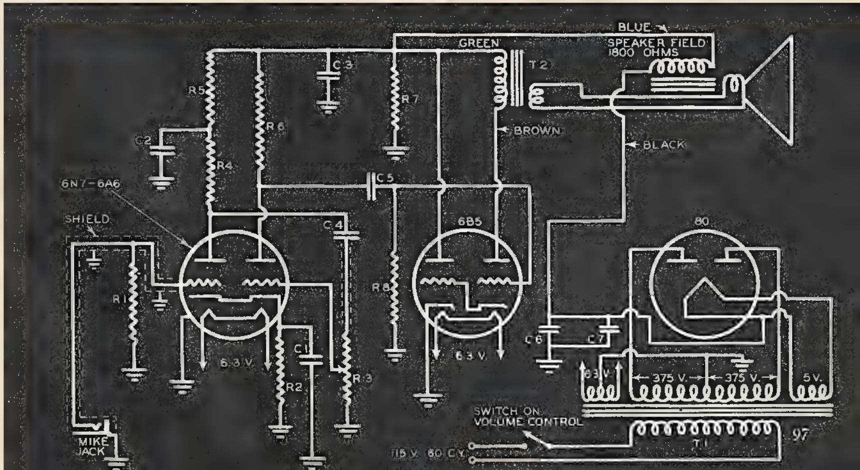
HERE'S a new amplifier designed especially for musical instruments. With it, the thin, weak tones of an ordinary violin acquire the depth and power of a Stradivarius; the guitar, mandolin and ukulele swell forth with startling brilliance and tone richness; the tiny spinet produces the volume of a concert grand! Even tap dancers can now put their stuff over in a big way.

The entire apparatus is light, portable and completely self-contained. It may be used any time, anywhere and on any musical instrument. It is simple to build and can be assembled by the average experimenter for less than twenty-five dollars including tubes, microphone and cabinet. And, by simply plugging in a different microphone, the apparatus becomes an excellent public-address system with plenty of power for the average hall. Any high-impedance pickup can be used, adapting the outfit to phonograph record reproduction.

Musicians have had difficulty in using ordinary public-address systems for amplifying musical instruments in most public places. The microphone would pick up not only the music but also background noises which often destroyed the effect. Further, considerable care was necessary in the placement of the speaker or the sound would bounce back into the microphone and create a howl. These troubles are avoided in this outfit by the use of a special microphone which is completely sealed and is sensitive only to sound vibrations picked up from the instrument with which it is placed in contact. This microphone is a tiny affair, only an inch wide and a half-inch high, moulded in a soft rubber case so it may be tucked under a violin tail-piece or fastened with rubber bands or rubber cement to any other instrument without damaging the surface of the instrument in any way. The natural tone of the instrument is not changed; the response of the microphone is rated flat within 1 db from 60 to 6,000 cycles—from an octave above the lowest note on the piano to nearly an octave above the highest note.

The input tube is a 6N7, which contains two medium high-mu triodes in a single envelope. These are cascaded to give two stages of amplification in a single tube. The measured gain is 30 per stage, so we get far more gain from this arrangement than can be had with a single pentode or any two ordinary triodes.

[*Continued on page* 140]



MAKE YOUR OWN CURTAIN FIXTURES

ATTRACTIVE [illegible] are easy to make. The [illegible] of [illegible] pressed-wood, plywood [illegible] stock of [illegible] The [illegible] on the following page [illegible] to follow. [illegible] a master pattern in marking [illegible] as many additional ones as needed.

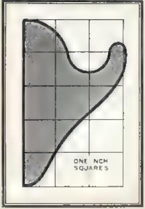
Smooth poles of 1 and 1⅜-inch diameters, which are the most popular sizes, are obtainable for about three cents a foot at most lumber yards. Mount the brackets on the window frames and then cut the poles so that they overhang about an inch on each side. Carefully mark the positions of the brackets on the poles, so that you can [illegible] grooves into them at these points. The rods [illegible] hang perfectly without shifting when the curtains are hung on.

[illegible] length for average windows. Just as good a job can be done on a drill press with ¼-inch routing tool. The above photograph shows the set-up. A short piece of 2x3 [illegible] clamped to the drill press table so that [illegible] acts as a stop, being placed to bring the edge of the routing cutter to the outer pencil line on the pole. Lock the spindle so that the cutter will dig about ¼-inch into the wood and set the drive pulleys for highest speed. Now, pushing the pole firmly against the block, rotate it slowly into the cutter, taking small bites at a time. To widen the groove, reset the block to the left, and repeat the [illegible] operation. If the pole is held flat on the drill press table and fed in evenly, a perfect groove will be obtained.

Rings and pole end pieces can be turned on a lathe, and make a nice exercise for the skilled wood turner, or they can be bought ready made for a few cents each.

The finish of the fixtures will depend on the color scheme of the room and of the curtains. If the walls and the window [illegible] are light colored, an [illegible] combination [illegible] wood poles and end pieces coated merely with shellac [illegible] and [illegible]

Right: A T-shaped jig is a big help in making the brackets. The upright piece is clamped in the jaw and the [illegible] has a slot in its end through which the blade of the coping saw [illegible]. Left: [illegible]



Above: This simple pattern is suggested for the end brackets [illegible] window [illegible]

SELECTING WOOD for the CAMPFIRE

By

[illegible]

Campfires are not limited to the summer months. A good fire can be built on snow-crusted ground, as is evident in the picture above. Winter fires should be built on a raft of slow burning logs. White ash is an exceptionally good wood that burns with a clear, even flame. Below: White birch bark, gathered in a basket and stored under the camp porch, provides excellent fire for kindling on [illegible].

IT'S behind [illegible] a real baking fire [illegible] wood whether [illegible] be used for fireplace burning, outdoor [illegible] range.

The sportsman should know his [illegible]. Some woods burn well green while others [illegible]. Certain trees can be [illegible] chopped green or dry, others are so hard [illegible] seasoned [illegible] would be [illegible] worthwhile.

The [illegible] guides golden rule for [illegible] will [illegible] ever [illegible] who [illegible] gather wood [illegible] ground seasoned dead wood [illegible] bushes or low trees, but any [illegible] directly on the ground will be [illegible] soaked.

Kindling is the first requisite of [illegible]. Many barks [illegible] white birch being [illegible] good in this respect. [illegible] looking shedding bark and [illegible] splinters from a lightning struck [illegible] the dead [illegible] evergreen. [illegible] gather [illegible] morning fire [illegible] the night before [illegible] a few kindling sticks to tuck in a dry spot away from the night dew. The next morning use a candle to get them going.

In a spot where [illegible] a more permanent fireplace can be erected. A grill placed across the fire supported [illegible] [illegible] be substituted.

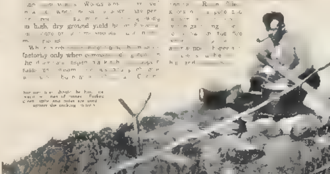
The sportsman [illegible] even [illegible] [illegible] woods [illegible] want [illegible] wood [illegible] serious.

[illegible] wood [illegible] Hickory is perhaps the best. The [illegible] green [illegible] Maple [illegible] perform [illegible] especially [illegible] birch and white [illegible] green than seasoned. The latter [illegible] for it is not only [illegible] Woods [illegible] in high, dry ground yield [illegible] more [illegible] places.

[illegible] factory only when [illegible] the [illegible] aspen [illegible]

Sometimes the chuck should be built near [illegible] of stones. Forked green sticks and poles are used to support the cooking utensils.

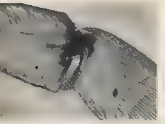
[illegible] there is a wind [illegible] The camper [illegible] [illegible] cooking [illegible] [illegible] off [illegible] [illegible] to [illegible] the fire [illegible] hard [illegible]



Unravel Secrets of Bee Life With Microscope

by Julian D. Corrington Ph.D.

[illegible]



Above—The third leg of a worker bee show[illegible]

The bee is a [illegible] masterpiece [illegible]

MANY indeed are the masterpieces of writing that have been devoted to th[illegible] havior and manifold duties afield of thes[illegible] all social animals and the real or fancied comparison of their busy careers with human [illegible] great city have intrigued mankind [illegible] by observing [illegible] activities can be appreciated only by th[illegible] who have taken the honeybee apart and made of her a number of microscope slides in orde[illegible] to gain a bee's eye view of her most ingenious [illegible]

Also it is quite amazing to dis[illegible] how many different mounts and studies—all interesting—can be made from a single individual of so small a creature. If you own a microscope and make your own slides, you may have at some time mounted a wing or leg and thought you knew the whole sto[illegible]

To begin with there are three ca[illegible] queen, drone and worker, each with [illegible] ive structures. Then there are the [illegible] stages, egg, larva, pupa and adult, with features peculiar to each stage. From the [illegible] and economic [illegible] honey and wax. By no means all of the possible preparations would interest th[illegible] professional beeke[illegible] scientists, but there stil[illegible] number of general importance.

Three types of slides will be discussed a[illegible] examples. Specimens of bees are obtainable almost everywhere at all seasons, but if you live in a city and cannot locate them in parks or flower gardens, they may be purchased as preserved specimens for a few cents. An in[illegible] and cyanide bottle are not necessary if you do not have them, since a bee engaged in sipping [illegible] flower is easily and safely cap[illegible] [illegible] alcohol, one-third glycerine, and one-third water.

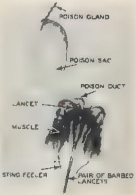
Using a pair of forceps on a dead specimen of adult worker bee, wet or dry, remove a hind wing and place in the center of a clean slide. Add a few drops of 95% alcohol and keep the wing covered with this fluid over a period of five minutes. Drain by tilting the slide, then place carbol-xylol on the wing for five minutes more. Do not allow these liquids to evaporate completely at any time. Finall[illegible] drain off the xylol and add a drop of balsa[illegible] then apply the cover glass. Set aside to [illegible] or put in a slide warmer until the balsam be[illegible] [illegible]

Examination will show a row of minute curved hooks running along the front margin of this rear wing. If a similar slice of th[illegible] [illegible] wing is made, you will find a fold in th[illegible] [illegible] margin forming a trough into which these hooks engage in order to hold the two wings of one side together [illegible] strengthening the flying apparatus. The number of such hooks varies from seventeen to twenty-six, averaging twenty-one. Numerous statistical studies have been made of this variation with the result that drones have been found to exhibit greater variability than workers, that a given bee does not inherit a set number of hooks but only a capacity to have anywhere from seventeen to twenty-[illegible] and that it seems to make no difference [illegible] survival value in competition among differen[illegible] bees as to how many hooks they may have within these limits.

A second type of slide introduces the technique [illegible] as potashing. Remove the [illegible] legs from one side of the body of a worke[illegible]

[Continued on page 140]

[illegible]



HOME SCIENCE STUNTS WITH CANDLES

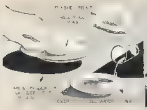
BLACK SPOT ON PAPER INDICATES CARBON

WHAT ARE CANDLES MADE OF? Light a candle and for an instant hold a sheet of white paper in the upper third of the flame. A deposit of black soot on the paper indicates that part of the candle consists of carbon. Now hold a clean cold glass over the flame as shown by the drawing above. It will be found that a mist will collect on the inside, indicating that hydrogen is being burned. Candles of today consist chiefly of paraffin, a hydrocarbon consisting of hydrogen and carbon. Before using the glass, be sure that the inside surface is cold and free from moisture. When hydrogen is burned in the presence of oxygen, water is the resultant by-product. If the glass were not held over the flame, the water in the form of steam would not be noticed as it would have no cooling surface on which to condense, thus showing its presence.

MAGIC CANDLE-LIGHTING METHOD. Light a candle, and after it has burned for a minute or two, light a match. Then blow out the candle, and hold the lighted match about an inch over the wick. It will be found that the candle will relight without the match being brought nearer than an inch.

SHORT PIECE OF CANDLE
WATER
DINNER PLATE

A HISSING CANDLE. Fasten a short piece of candle to a shallow plate. Pour into the plate about a half inch of water. Light the candle and quickly invert a glass over it. In a minute or two a hissing sound will be heard as the partial vacuum caused by the burning candle permits the outside pressure to force the water under the glass.

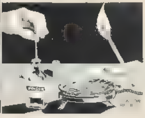


MAKING PERMANENT FINGERPRINTS. Light an ordinary candle and allow a small pool of wax to form in a saucer. While the wax is still in a liquid state, place a finger into it and hold it there until the wax starts to harden. Remove the finger and pour some cold water over the wax. An excellent permanent mould will be the result.

BIRTHDAY CANDLE

HOW MUCH CANDLE POWER HAS A MATCH? Hold a lighted match behind a grease spot on a piece of paper. Then stand a small lighted candle behind the paper the same distance away as the match. Compare the brilliance of the light through the spot with the candle and the match. The number of candles required to give the same illumination as the match is the candle power of the match.

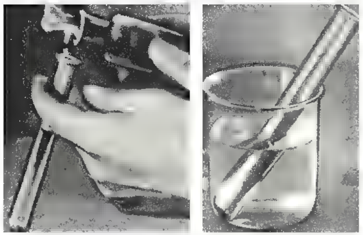
A SWIMMING SNAKE. Soak a short piece of cord in molten candle grease. When it is thoroughly coated, press into one end a short piece of iron wire. Then place the cord into a pan of water, and by holding a magnet near the end into which the wire was placed, it will follow the magnet, swimming like a snake.



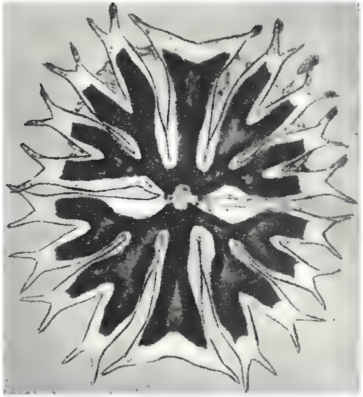
OLD FASHIONED MATCHES. Soak several pieces of soft wood in candle grease, with the exception of about one-half inch at one end. Then dip the "fired end" in some powdered sulphur. When one is lighted the match burns with a smooth and steady flame.

IS YOUR DRINKING WATER PURE?

Nessler's reagent is used for testing for ammonia. When a few drops of this reagent are added to the water, a brown precipitate is formed if ammonia or salts of ammonia is present.



Above—Testing for acid by adding a few drops of methyl orange to the water. If the color changes to red, acid is present. Above right—When testing for phosphate, the solution should be warmed to 50 degrees C.



A micro-organism known as a desmid. This differs from a diatom in that it lacks a siliceous skeleton.

ONLY a very small fraction of the water found on the earth is fit for human consumption. Although three-quarters of the earth is covered to an average depth of one mile, pure water is never found. Impurities may be present even in distilled water if it is made at home. This is especially true if large amounts of ammonia are present. This volatile substance comes over first, the later distillate is pure.

Three general types of impurities are usually found in all water, although to a lesser degree in water piped into our homes. These are organic matter, mineral matter and gases. Natural waters as a rule are abundantly supplied with minute living plants and animals and these may be collected and identified by filtering the waters of lakes, ponds and streams and observing the precipitate under a microscope. When it is necessary only to determine if the substance collected in the precipitate is organic or mineral, a little of it is scraped on a watch glass or porcelain dish and heated over a flame. If the substance chars, it is organic, the material remaining behind is inorganic. Organic material is absent from distilled water.

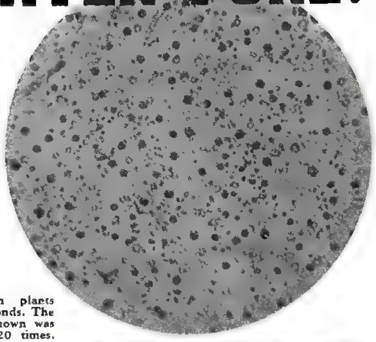
Ammonia should never be present in drinking water. If present it shows that the water is being contaminated. It is fairly easy to test for this substance by a very delicate reagent. Three parts of ammonia can be detected in ten million parts of water. Another element that should be absent is phosphates, especially in larger amounts. If present it is probable that the water is contaminated with sewage. The same is true if sodium chloride (common table salt) and sulphate of lime are present. The slightest quantity of nitrous acid makes the water dangerous for drinking purposes. All of these chemicals can be easily detected.

The presence of such salts as sodium carbonate, magnesium sulphate, etc., give us famous waters noted for their health giving properties.

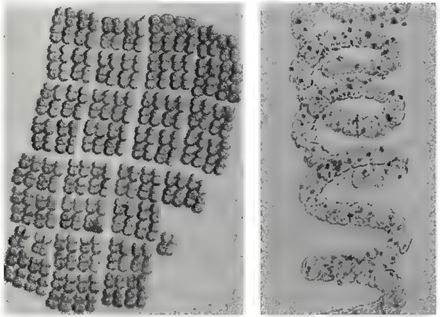
The chlorides of lime and magnesium are important for they are responsible for the hardness of water. The former produces temporary hardness, the hardness of the water being removed by prolonged boiling. The latter gives permanent hardness. Such hard water is injurious because it impedes digestion. With the following directions such injurious salts as phosphates, chlorides, ammonia and nitrous acid can be detected.

To test well or spring water, collect about one quart and let stand for about 24 hours. Then carefully pour off almost

[Continued on page 136]

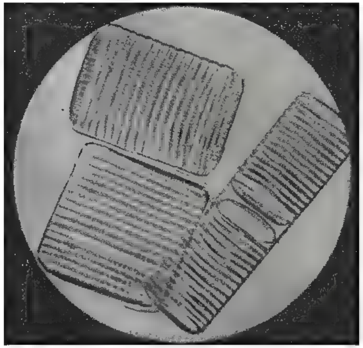


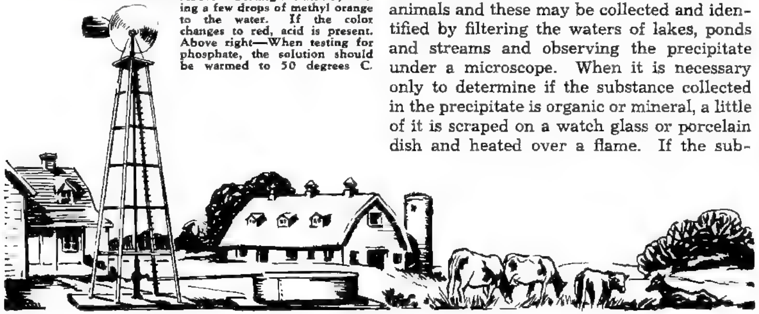
Tiny green plants found in ponds. The specimen shown was enlarged 320 times.



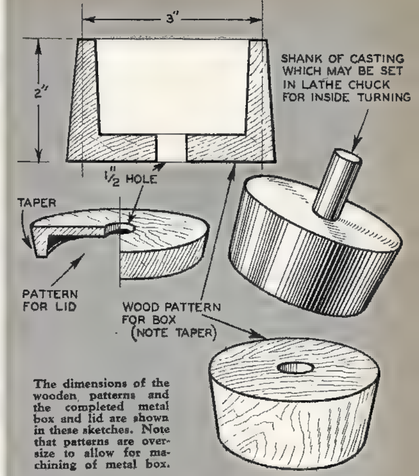
Examples of blue green algae. These have been magnified 600 times to make them easily visible. These are examples of the growths which may be found in some water.

Below—A diatom. Note the difference between this and the desmid on the opposite page. After death of a diatom, the skeleton becomes what is known as kieselguhr.





The process of creating the attractive and useful metal box and lid starts with the turning of patterns from close-grained wood such as gum or white pine, as shown in photos above. The patterns must be made oversize to allow for machining of the metal surfaces in the lathe. Left—Turning the metal box. Brass strips under each chuck jaw prevent marring of metal.


3"
2"
SHANK OF CASTING WHICH MAY BE SET IN LATHE CHUCK FOR INSIDE TURNING
1/2" HOLE
TAPER
PATTERN FOR LID
WOOD PATTERN FOR BOX (NOTE TAPER)

The dimensions of the wooden patterns and the completed metal box and lid are shown in these sketches. Note that patterns are oversize to allow for machining of metal box.

A Bronze Box And Lid

by
DALE R. VAN HORN

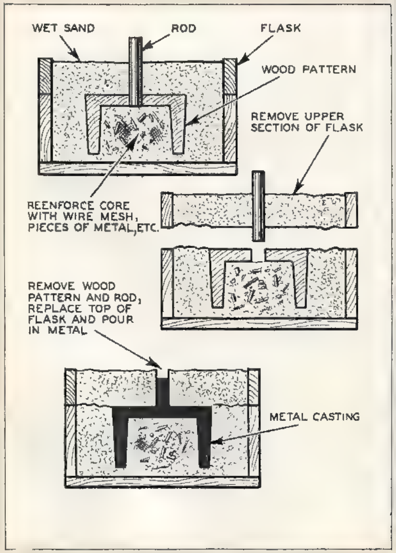
AS YOU add machines to your shop its flexibility and scope of operation increases. The acquisition of a metal-turning lathe and blast furnace will permit you to easily cast and turn various attractive and useful projects in metal.

Herewith is shown and briefly described the casting and finishing of a small aluminum bronze—that lovely, non-tarnishing gold-colored metal—box with lid. The process consists of turning of patterns of wood, the casting of the metal in duplicate and the turning of these castings to give the result in the photo of the finished job. It will require several hours from start to finish but the box will, even with a gas-pitted blemish or two, be a fine addition to the mantel, smoking stand or wall shelf. Moreover, it's a permanent affair.

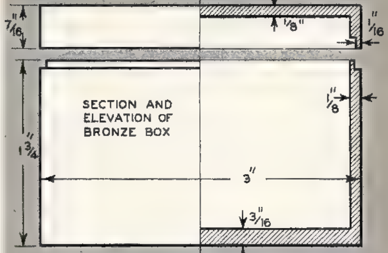
Assuming that your blast furnace has up to about six cubic inches capacity, we will make a box three inches in diameter and a shade more than two inches high. Turn the patterns from a close-grained wood such as gum or white pine. For the box pattern turn the piece oversize and taper the sides, both from the outside and inside, from the bottom toward the top. This facilitates removal of the pattern after packing in the mold. Make the box pattern two inches high, sand smooth and bore a half inch hole exactly through the center. In like manner turn the pattern for the lid, providing it with tapered side walls and a half-inch hole through the center. In each case the wood pattern should have greater diameter, height and thickness than the finished box will have so that all surfaces can be machined smooth in the metal lathe.

A half-inch rod is inserted in the center hole of the box pattern and graphite dusted well over it. To make a smoother job, hot paraffin can be brushed onto the wood and the surplus rubbed off while still in the lathe. This is set in the lower half of the flask with the inside packed tightly with the molding sand. To insure having the pattern lift out smoothly, reinforce this core with some pieces of wire or strips of quarter-inch mesh wire. The sand must not be too wet, otherwise surplus steam may pit the casting. Finish the

[*Continued on page* 140]

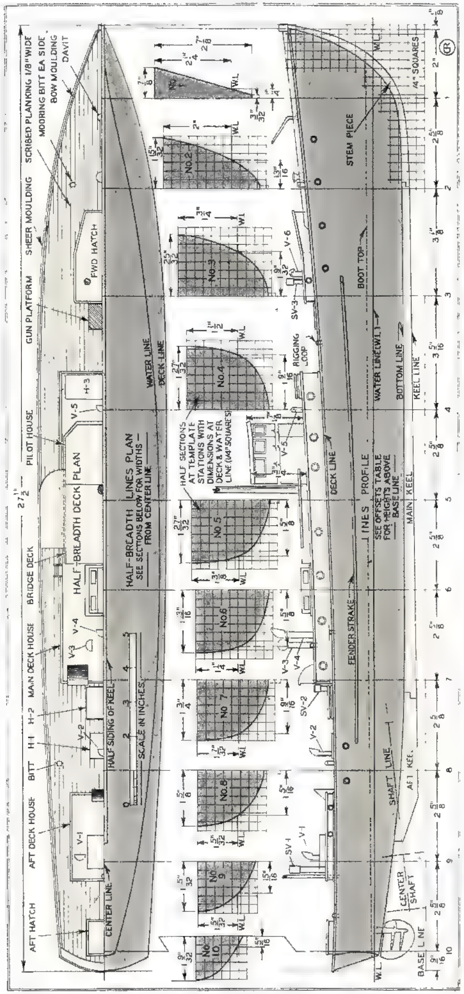

WET SAND
ROD
FLASK
WOOD PATTERN
REMOVE UPPER SECTION OF FLASK
REENFORCE CORE WITH WIRE MESH, PIECES OF METAL, ETC.
REMOVE WOOD PATTERN AND ROD, REPLACE TOP OF FLASK AND POUR IN METAL
METAL CASTING

The method of using the wooden patterns in preparing the wet sand mold for casting the metal box is shown in sketches above. Top photo—The completed box.


7/16"
1/8"
1/16"
SECTION AND ELEVATION OF BRONZE BOX
1/8"
1 3/4"
3"
3/16"

Below—Turning the metal lid. The protruding rod, which serves to hold the piece in lathe chuck while turning inside, is cut off later.

BUILD THIS U. S. COAST GUARD PATROL BOAT


SCRIBED PLANKING 1/8" WIDE
MOORING BITT EA SIDE
BOW MOULDING
DAVIT
SHEER MOULDING
FWD HATCH
GUN PLATFORM
PILOT HOUSE
BRIDGE DECK
MAIN DECK HOUSE
H-1
H-2
H-3
BITT
AFT DECK HOUSE
AFT HATCH
CENTER LINE
HALF-BREADTH DECK PLAN
HALF-BREADTH LINES PLAN
SEE SECTIONS BELOW FOR WIDTHS FROM CENTER LINE
HALF SIDING OF KEEL
SCALE IN INCHES
WATER LINE
DECK LINE
HALF SECTIONS AT TEMPLATE STATIONS WITH DIMENSIONS AT DECK & WATER LINE (1/4" SQUARES)
NO.1
NO.2
NO.3
NO.4
NO.5
NO.6
NO.7
NO.8
NO.9
NO.10
W.L.
V-1
V-2
V-3
V-4
V-5
V-6
SV-1
SV-2
SV-3
STEM PIECE
BOOT TOP
RIGGING LOOP
DECK LINE
FENDER STRAKE
LINES PROFILE
SEE OFFSETS TABLE FOR HEIGHTS ABOVE BASE LINE
WATER LINE (W.L.)
BOTTOM LINE
KEEL LINE
MAIN KEEL
AFT KEEL
SHAFT LINE
CENTER SHAFT
BASE LINE
1/4" SQUARES
$27\frac{1}{2}$"

A template of each station given should be cut out before any attempt is made to shape the hull. If the hull is made up of two lifts, the division should be at the water line. The most satisfactory wood for hull will be straight grained, well dried white pine.

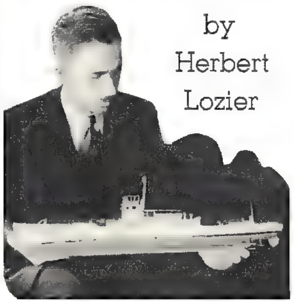
DURING the World War a large number of vessels were built to protect shipping against submarine warfare. Some of these ships were known as 110-foot sub-chasers. Powered by three 525 horsepower engines, they had a speed of approximately 15 knots. After the war, many of them were sold to private individuals, used for naval training purposes, or turned over to the Coast Guard for patrol purposes. The model presented is typical of this type, and was copied from the U. S. Coast Guard Patrol Cutter *Smith*.

Built to a scale of ¼" to a foot, the model is 27½" long, 3¾" wide, and $3\frac{13}{16}$" deep at the bow. The hull can be built up in any of three ways, from a solid block; bread-and-butter fashion—that is, one lift on another, or using ribs and planking. However, the latter method is difficult and should be attempted only by persons experienced in the art of ship modeling.

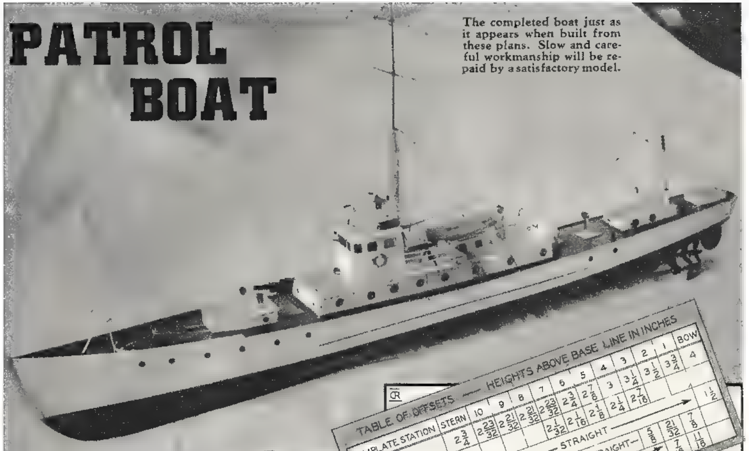
If a solid block is used, obtain a straight grained, well dried piece of pine measuring 4"x4"x30". If lifts are used, each lift should measure not less than 3¾" wide, ¾" thick and 30" long. Four lifts of this size are required to give the hull the correct height. The simplest method for the average builder is the use of two lifts, as shown in the drawings.

After the two pieces are fastened together, the saw cuts are made as shown in the drawing. A series of templates are made of cardboard, cut from deck to centerline with the water line marked on each. These are numbered to correspond with lines drawn across the hull. These templates should be cut with great care to insure even hull lines. A round stick about 15" long should be screwed to the deck, the screw holes being positioned so that they will be covered by the deck house. This enables the builder to tilt the hull to any desired angle in a vise while shaping it.

When cutting the hull to the templates, do not cut it exactly to any one template; work with several at a time, and when the hull is roughed to shape, trim it down smoothly with a plane and sandpaper. Then remove



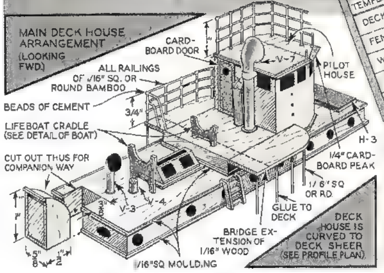
by
Herbert
Lozier

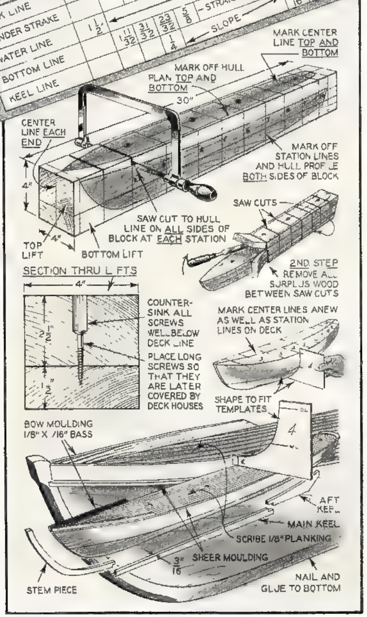


The completed boat just as it appears when built from these plans. Slow and careful workmanship will be repaid by a satisfactory model.

TABLE OF OFFSETS — HEIGHTS ABOVE BASE LINE IN INCHES

TEMPLATE STATION	STERN	10	9	8	7	6	5	4	3	2	1	BOW
DECK LINE	$2\frac{3}{4}$	$2\frac{23}{32}$	$2\frac{21}{32}$	$2\frac{21}{32}$	$2\frac{23}{32}$	$2\frac{3}{4}$	$2\frac{7}{8}$	3	$3\frac{1}{4}$	$3\frac{1}{2}$	$3\frac{3}{4}$	4
FENDER STRAKE					$2\frac{1}{32}$	$2\frac{1}{16}$	$2\frac{1}{8}$	$2\frac{1}{4}$	$2\frac{7}{16}$			
WATER LINE	$1\frac{1}{2}$	←				STRAIGHT					→	$1\frac{1}{2}$
BOTTOM LINE		$1\frac{11}{32}$	$\frac{31}{32}$	$\frac{23}{32}$	$\frac{5}{8}$	— STRAIGHT —		→	$\frac{5}{8}$	$\frac{21}{32}$	$\frac{7}{8}$	
KEEL LINE				$\frac{1}{4}$	←		SLOPE		→	$\frac{7}{16}$	$\frac{11}{16}$	


MAIN DECK HOUSE ARRANGEMENT (LOOKING FWD)
CARD-BOARD DOOR
ALL RAILINGS OF 1/16" SQ. OR ROUND BAMBOO
V-7
PILOT HOUSE
BEADS OF CEMENT
3/4"
LIFEBOAT CRADLE (SEE DETAIL OF BOAT)
H-3
1/4" CARD-BOARD PEAK
CUT OUT THUS FOR COMPANION WAY
V-3
V-4
1/16" SQ OR RD.
GLUE TO DECK
BRIDGE EXTENSION OF 1/16" WOOD
DECK HOUSE IS CURVED TO DECK SHEER (SEE PROFILE PLAN)
1/16" SQ MOULDING
5/8"
1/2"


MARK CENTER LINE TOP AND BOTTOM
MARK OFF HULL PLAN TOP AND BOTTOM
30"
CENTER LINE EACH END
MARK OFF STATION LINES AND HULL PROFILE BOTH SIDES OF BLOCK
4"
SAW CUTS
SAW CUT TO HULL LINE ON ALL SIDES OF BLOCK AT EACH STATION
TOP LIFT
BOTTOM LIFT
2ND STEP REMOVE ALL SURPLUS WOOD BETWEEN SAW CUTS
SECTION THRU LIFTS
4"
COUNTERSINK ALL SCREWS WELL BELOW DECK LINE
PLACE LONG SCREWS SO THAT THEY ARE LATER COVERED BY DECK HOUSES
MARK CENTER LINES ANEW AS WELL AS STATION LINES ON DECK
SHAPE TO FIT TEMPLATES
BOW MOULDING 1/8" X 1/16" BASS
4
AFT KEEL
MAIN KEEL
SCRIBE 1/8" PLANKING
SHEER MOULDING
3/16
STEM PIECE
NAIL AND GLUE TO BOTTOM

Above is shown the method of carving the hull. After the lifts are screwed together, they should be marked carefully for each saw cut. At the left is shown details for the deck house construction. This should be curved to the deck sheer.

To avoid false readings caused by the strong light of the sky, hold the meter aimed at the subject.

The angle of view of a standard exposure meter is illustrated above. It is advisable to point the meter downward a bit even when evaluating a scene across the street to eliminate some of the sky light.

GETTING THE MOST FROM YOUR EXPOSURE METER

by Herbert C. McKay

EXPOSURE meters are divided into two classes, the photo-electric type and the visual extinction type. Both are good, and when properly used, both are dependable guides to correct exposure.

What constitutes correct photographic exposure? The laboratory worker will tell you that the correct exposure is one which results in a photographic image whose various degrees of density correspond to the intensities of light reflected from the image. This is perfectly true from a technical point of view but in very many cases it is far from the truth in practical photography. Photography is no longer a method of mechanically recording an image in front of a camera; it is a medium through which we may convey a definite idea. Very often it is essential to this result that the exposure be deliberately less or greater than the theoretical normal. The exposure meter can tell you just how much above or below normal the exposure should be in order to obtain the effects you desire.

For example, if you have a subject in which the hands and face stand out strongly against a black background, a background with which the black costume of the subject merges almost imperceptibly, the exposure meter will indicate the various exposures which will record the hands and the face and it will also give you the maximum exposure which can be used without recording the dark background. Such meter readings are called differential readings.

Likewise, when photographing a landscape in which some object in the near foreground is used for decorative purposes, the proper use of the exposure meter will enable you to give an exposure which will produce good results in the landscape and also give you the exposures desired for the foreground. You may throw the foreground into black silhouette or you may give it almost any degree of detail you desire.

It is obvious from these statements that the exposure meter cannot successfully be used from the position of the camera. It is a fundamental of exposure practice to make the meter reading at a distance from the object which is not greater than the width of that object. If you are making a reading of the face of a human subject the meter should be not more than ten or at most twelve inches away. If the subject is a group and you are interested in costume as well as in faces then you make your reading at a distance of four or five feet. If the subject is architecture, and forty or fifty feet wide, you can make your reading from across the street.

As a rule, if you will spread the index and second finger as widely as you can, this will give you an approximate angle of reading of the meter.

Obviously if you have a model in a light costume posed against a black background, and you are far enough away to get a full figure, a meter reading from the camera position would be largely a reading of the black background and the result would be a badly over-exposed image of the model.

In tropical countries and even in the temperate zones in the bright sunlight of summer a general reading from the camera position will usually result in a very hard negative and in shadows which are almost jet black. If you are going to make a photograph of a girl wearing a hat which shades her face, take the meter right up to her, make the reading on the shaded part of the face and give that exposure. Tests have shown that in actual practice you can get a usable negative when the exposure is as little as one-tenth of the normal while it will not injure the printing qualities of the negatives if the exposure is considerable above normal on the other side.

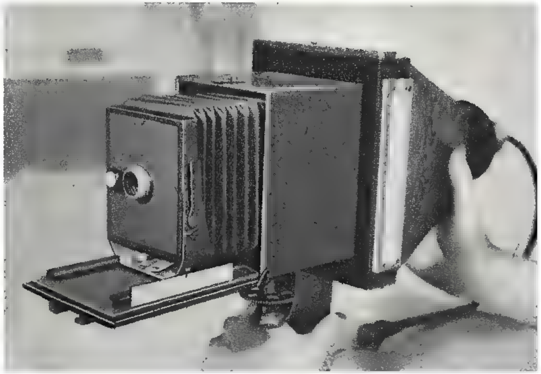
Several photo-electric type meters are particularly well adapted to differential reading because two "extreme" arrows on the dial indicate the average latitude of film. If you read the deepest shadow and the brightest highlight and then set the two arrows of the dial as nearly as possible to these two readings, the central indicator will show the proper exposures to get this range. If the two extreme readings lie within these two outside arrows, you will get a good reproduction of all objects in the scene, but they

[Continued on page 139]

THE "AUTOSET" ENLARGER

by C. C. Beck

It has a set focus calibrated to predetermined enlargement sizes for negatives up to 4x5.



THIS enlarger, while built along conventional lines, possesses several features which make it an outstanding piece of home-built equipment. Chief of these is the slide rule focusing arrangement which makes it possible to set the enlarger exactly to the size enlargement required, in a matter of seconds, bringing it automatically into perfect focus at the same time. This is an enormous improvement over most enlargers which take several minutes of juggling back and forth with the lens wide open to secure enough light and then stopping down to the required opening, before the print can be made. Using the slide rule scales, the light need be switched on only for the actual projection; focusing is done by whatever illumination you have in your dark room.

As designed and built, the enlarger can be folded up and then taken apart for storing or carrying in a suitcase. If this feature is not desired, the construction can be simplified considerably and several parts eliminated without the least loss of efficiency in the finished job. Should the focusing and ventilating systems prove too complicated as shown, these can also be handled more simply.

A 100-watt bulb in the tin reflector gives ample illumination in actual use, with printing time ranging from fifteen to sixty seconds. The reflector is cut from sheet tin to the pattern shown in Fig. 3, bent up, and soldered down the open side. It is capped with a section of a tin can which carries the ventilator and the cooling fins as shown in Fig. 1. Construction of these calls for some rather neat soldering but should not prove beyond the ability of a good home workman. Saw off two inches of a tin can 2½ inches in diameter and cut a hole 1⅜ inches in diameter in its top. Around this hole drill or punch four small holes at equal intervals. Solder a tin collar ½ inch high around the center hole, and another collar ⅝ inch high and 2¼ inches in diameter around this. Now cut two tin washers exactly to fit the space between and in each punch four holes. Solder these into position with the holes staggered and you have a compact and efficient light trap which will keep your reflector from sweating up inside and prolong the life of your bulb. The middle washer, you will notice, is held in position before soldering by two ⅛-inch strips dropped in beneath it. Over the whole thing goes a threaded lamp-shade holder from the dime store. This is held both by its own screws and by soldering to the can and to the inner collar. Now slip the four cooling rings up and solder them fast and you can solder the whole unit to the square top of the reflector and this in turn to the reflector itself.

From plywood build a shallow topless box 8x5¾x1¾ inches with a square hole 5¼x3¾ inches in its bottom. Leave a space ½ inch high at the front for the negative holder to slide in, and glue a strip of ⅛-inch balsa or cigar box wood ¾ inch wide inside each side ½ inch up from the bottom. At front and back glue ¼-inch strips of the same width. Then glue a ⅛-inch square strip all the way around inside and your 5x7-inch opal glass should drop right in, to be held in place with a small brad or two. The remaining ¼ inch at the top is for the reflector to fit into, and you can glue a narrow strip of black velvet around the inside of the box to insure a light-tight fit against the sides of the reflector.

If you are not making a folding model, you can now proceed to build a plywood frame 5¾x4x4 inches deep except at the back, where it will be 9¼ inches deep. On this back build

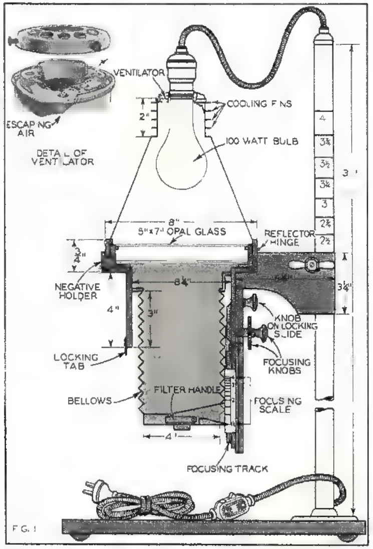
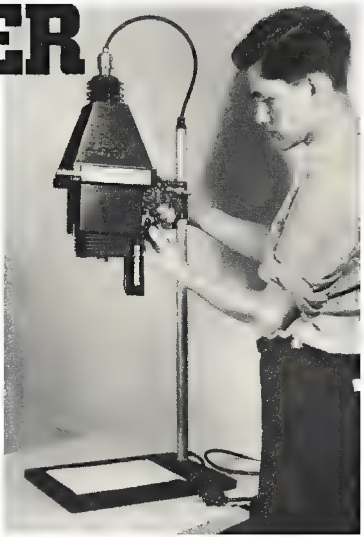

VENTILATOR
ESCAPING AIR
DETAIL OF VENTILATOR
COOLING FINS
2"
100 WATT BULB
4
3¾
3½
3¼
3
2¾
2½
3'
8"
5"x7" OPAL GLASS
REFLECTOR HINGE
¾"
NEGATIVE HOLDER
8¼"
3¼"
4"
3"
KNOB ON LOCKING SLIDE
LOCKING TAB
FOCUSING KNOBS
BELLOWS
FILTER HANDLE
FOCUSING SCALE
4'
FOCUSING TRACK

FIG. 1

Top—focusing end of the enlarger showing bellows, focusing knob, lens board and supports, and track. Knob left of lens opening controls diaphragm stops. Above—Details of enlarger with bellows extended.



Above—Completed enlarger in operation. Below—Details of focusing mechanism optional with builder.

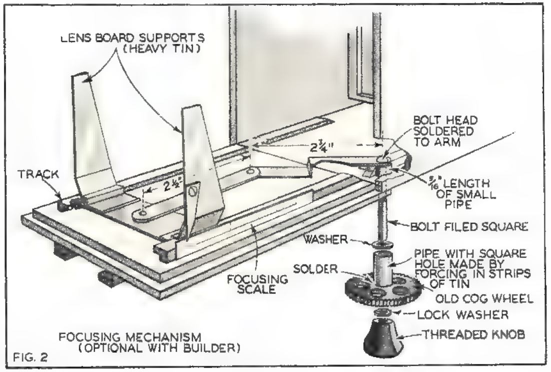
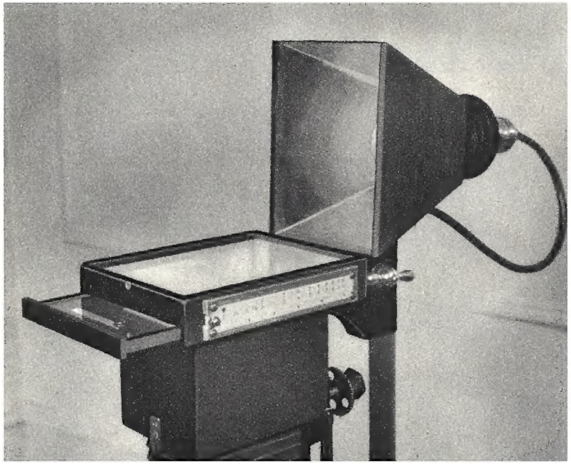

LENS BOARD SUPPORTS (HEAVY TIN)
TRACK
2½"
2¼"
BOLT HEAD SOLDERED TO ARM
5/16" LENGTH OF SMALL PIPE
BOLT FILED SQUARE
WASHER
PIPE WITH SQUARE HOLE MADE BY FORCING IN STRIPS OF TIN
SOLDER
FOCUSING SCALE
OLD COG WHEEL
LOCK WASHER
THREADED KNOB
FOCUSING MECHANISM (OPTIONAL WITH BUILDER)

FIG. 2



Above—Reflector folded back showing opal glass and negative holder partly pulled out. Right—This calibrated slide-rule indicates how to set the enlarger to bring any negative up to any required size.

up the tracks of ⅛-inch material. Space them 2½ inches apart and build a wood or metal board 1¼x2½ inches to slide between them. Onto this is bolted or screwed the two lens board supports. You can work out some arrangement to lock the whole thing at any position if you do not make the focusing device shown in Fig. 2. The one shown takes a little more time and will have to be quite carefully fitted together but works very well and adds to the professional appearance and operation of the enlarger when completed.

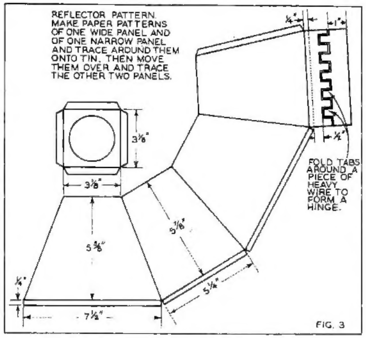

REFLECTOR PATTERN. MAKE PAPER PATTERNS OF ONE WIDE PANEL AND OF ONE NARROW PANEL AND TRACE AROUND THEM ONTO TIN. THEN MOVE THEM OVER AND TRACE THE OTHER TWO PANELS.
¼"
1"
3⅛"
3⅛"
5⅜"
5⅞"
5¼"
½"
¼"
7½"
FOLD TABS AROUND A PIECE OF HEAVY WIRE TO FORM A HINGE.

FIG. 3

The construction of the folding model can be worked out from the drawings and photos. The part that folds must, of course, fit exactly into the end of the box. It is hinged by two tin tabs or ears at the sides pivoting on small nails, and it is locked in position by another slide 5¾ inches long, which works in tracks similar to the ones used in the focusing bed. When shut, a projecting nail in the end of the slide fits into a corresponding hole in the little tab on the front of the enlarger. Also the focusing tracks will have to be cut at the folding line. You will notice from the plans, Fig. 1 and 2, that the bellows fits back inside the box against a frame glued inside the box 3 inches up from bottom edge. At the back this frame has a setback to accommodate the focusing arms in folded position.

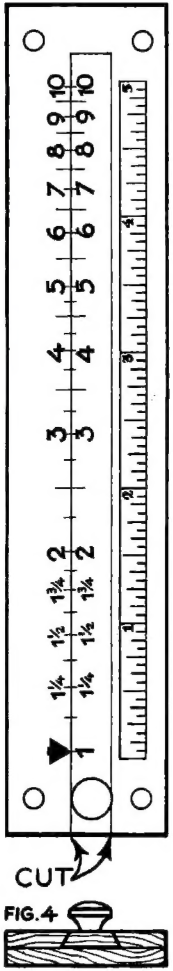

1
1¼
1½
1¾
2
3
4
5
6
7
8
9
10
CUT

FIG. 4

Materials Used

1 pc. opal glass 5x7 in.
2 pc. clear glass 5x7 in.
1 pc. black rubberized focusing cloth 10x15⅞ in.
1 lens of 5 to 5½-inch focal length
1 pc. 5x7 in. ground glass

The above materials may be purchased in any camera supply house. Cost of the glass is very little. The focusing cloth is about 50 cents. A suitable lens may be bought for $8 to $12.

1 lamp socket
1 threaded lamp shade holder
10 feet of lamp cord
2 small threaded knobs
1 switch
1 male plug
3 rubber feet

The above items may be purchased in dime or hardware stores.

31-inch length of 1-inch-outside-diameter pipe threaded at one end
1 pipe flange
1 pc. sheet roof tin
Scrap galvanized iron (16, 18 or 20 gauge)

The above materials may be purchased in hardware or plumbing shops. Other materials needed are plywood and balsa wood obtainable at lumber yards; scrap wood, an old faucet, a tin can obtainable from scrap yards.

You had best construct your own bellows, exactly as shown in Fig. 5, to insure a fit in the folding model with focusing knobs; otherwise a second-hand camera bellows of about 4 inches extension can be used. This can be fastened to a frame at the bottom of the box and not set back in at all. To build the bellows, tack a piece of black rubberized focusing cloth to a board, rubber side up, and with pencil lay out the lines shown in Fig. 5. Cut a number of ¼-inch strips of thin fibre or thin cardboard, and glue each one down with iron glue or other good adhesive. Give it a coat of flat black paint and fold it around and glue the ends together. It will fold up almost automatically when you glue the ends together, but you may have a little trouble get-

[*Continued on page* 138]

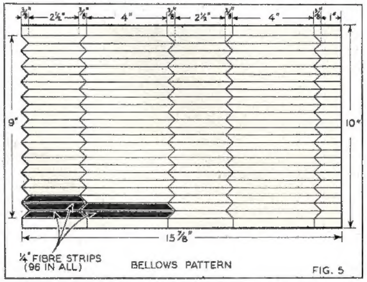

⅜"
2½"
⅜"
4"
⅜"
2½"
⅜"
4"
⅜"
1"
9"
10"
15⅞"
¼" FIBRE STRIPS (96 IN ALL)
BELLOWS PATTERN

FIG. 5

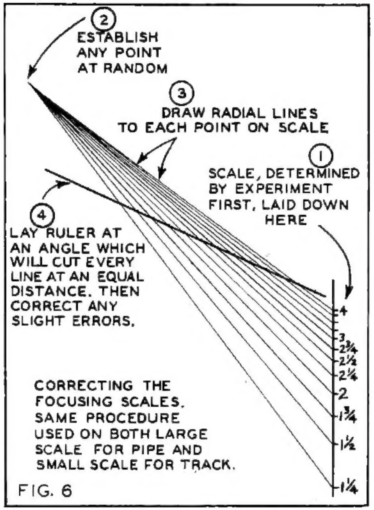
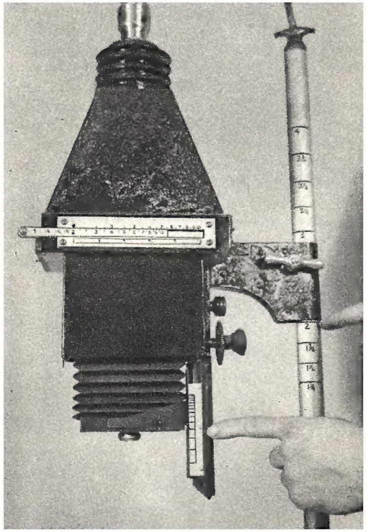

② ESTABLISH ANY POINT AT RANDOM
③ DRAW RADIAL LINES TO EACH POINT ON SCALE
① SCALE, DETERMINED BY EXPERIMENT FIRST, LAID DOWN HERE
④ LAY RULER AT AN ANGLE WHICH WILL CUT EVERY LINE AT AN EQUAL DISTANCE. THEN CORRECT ANY SLIGHT ERRORS.
4
3
2¾
2½
2¼
2
1¾
1½
1¼
CORRECTING THE FOCUSING SCALES. SAME PROCEDURE USED ON BOTH LARGE SCALE FOR PIPE AND SMALL SCALE FOR TRACK.

FIG. 6



Top—Showing method of correcting focusing scale. Above—Showing scale settings for a 2-time enlargement. Left—Details of bellows.

BUILT-IN DARKROOM

WHERE there is a spare room in the house devoted to general purposes such as sewing, home-work or drawing, this compact dark room can be built into a corner without seriously crowding other activities.

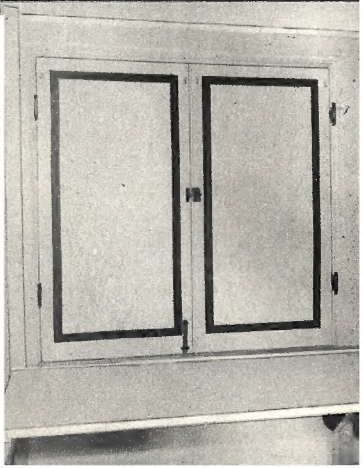
The floor-space of the original is only four by six feet, Fig. 1, and with screws into walls and floor placed judiciously, no damage is done that cannot be repaired with plastic cement in case you wish to take the partitions down later.

Framing throughout is two-by-two pine, Fig. 2, and where these join wall, floor and ceiling, countersunk flathead wood screws are used into studs and beams. In standard practice studs are spaced 16 inches on centers, beams usually closer together. To locate either, tap plaster lightly with a hammer until the sound indicates, not a hollow space beneath, but solid wood. Then drill through to confirm the location. By using screws instead of nails the framing is brought up snugly, closing cracks that might otherwise let light through. In case you are not able to shut out light entirely, caulk the seam either with candle wicking driven in with a screwdriver, or with putty.

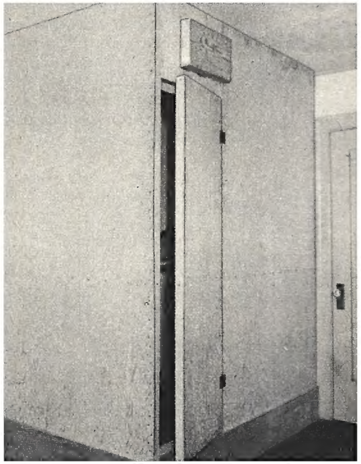
Whatever alterations from the original floor plan you are required to make, bear in mind that plywood panels are 48 inches wide, and arrange your area, if possible, for cutting the plywood without waste.

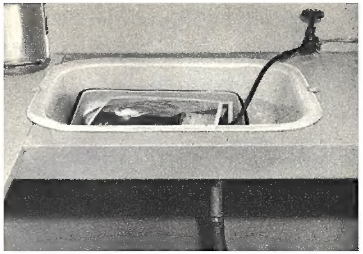
In the original it was necessary to fit around molding, baseboard and, on one side, a window sill. A board ¾ by 6 inches was trimmed to fit the obstructions and then nailed permanently to the plywood, as shown.

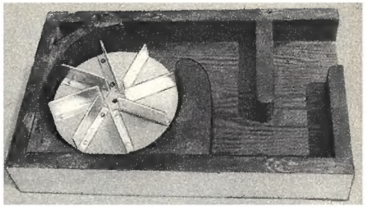
The door is simply a plywood panel on a two-by-two frame, closing against plywood strips shutting out the light, Fig. 3. A triangular wood gusset is placed back of the joint.



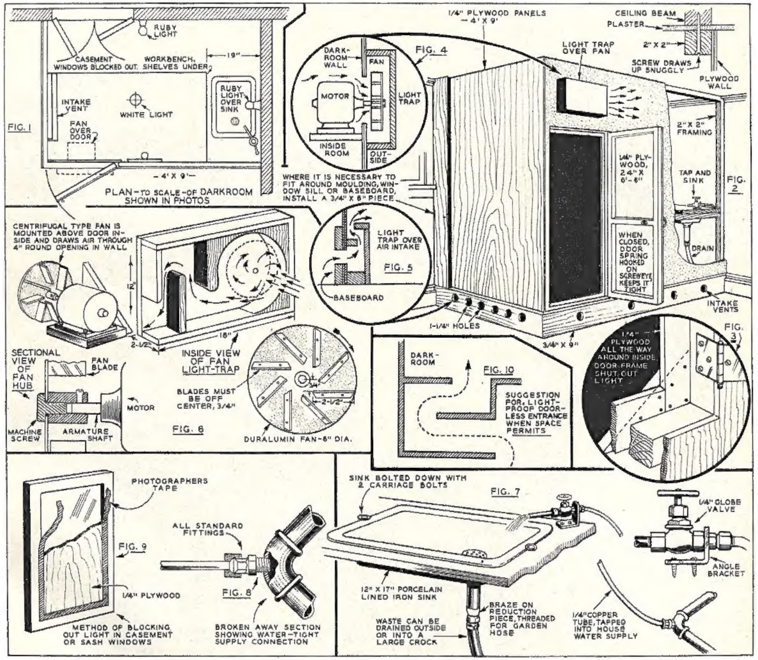
Above: Plywood panels cover window panes and are sealed with black Scotch tape around edges. Below: The completed plywood darkroom. Box over door is fan housing.







Above: Details of home-made centrifugal type ventilating fan. Left: Simple sink for washing purposes. Below: Complete construction plans of darkroom and its fittings.


RUBY LIGHT
CASEMENT WINDOWS BLOCKED OUT
WORKBENCH, SHELVES UNDER
19"
RUBY LIGHT OVER SINK
INTAKE VENT
WHITE LIGHT
FIG. 1
FAN OVER DOOR
4' X 9'
PLAN—TO SCALE—OF DARKROOM SHOWN IN PHOTOS
DARK-ROOM WALL
FAN
MOTOR
LIGHT TRAP
INSIDE ROOM
OUT-SIDE
FIG. 4
WHERE IT IS NECESSARY TO FIT AROUND MOULDING, WINDOW SILL OR BASEBOARD, INSTALL A 3/4" X 6" PIECE
CENTRIFUGAL TYPE FAN IS MOUNTED ABOVE DOOR INSIDE AND DRAWS AIR THROUGH 4" ROUND OPENING IN WALL
12"
18"
2-1/2"
LIGHT TRAP OVER AIR INTAKE
FIG. 5
BASEBOARD
1/4" PLYWOOD PANELS — 4' X 9'
CEILING BEAM
PLASTER
2" X 2"
SCREW DRAWS UP SNUGGLY
PLYWOOD WALL
LIGHT TRAP OVER FAN
2" X 2" FRAMING
1/4" PLYWOOD, 24" X 6'-6"
TAP AND SINK
FIG. 2
DRAIN
WHEN CLOSED, DOOR SPRING HOOKED ON SCREWEYE KEEPS IT TIGHT
INTAKE VENTS
1-1/4" HOLES
3/4" X 9"
SECTIONAL VIEW OF FAN HUB
FAN BLADE
MOTOR
MACHINE SCREW
ARMATURE SHAFT
INSIDE VIEW OF FAN LIGHT-TRAP
BLADES MUST BE OFF CENTER, 3/4"
3/4"
2-1/2"
FIG. 6
DURALUMIN FAN—6" DIA.
DARK-ROOM
FIG. 10
SUGGESTION FOR LIGHT-PROOF DOORLESS ENTRANCE WHEN SPACE PERMITS
1/4" PLYWOOD ALL THE WAY AROUND INSIDE DOOR-FRAME SHUT OUT LIGHT
FIG. 3
PHOTOGRAPHERS TAPE
FIG. 9
1/4" PLYWOOD
METHOD OF BLOCKING OUT LIGHT IN CASEMENT OR SASH WINDOWS
ALL STANDARD FITTINGS
FIG. 8
BROKEN AWAY SECTION SHOWING WATER-TIGHT SUPPLY CONNECTION
SINK BOLTED DOWN WITH 2 CARRIAGE BOLTS
FIG. 7
1/4" GLOBE VALVE
ANGLE BRACKET
12" X 17" PORCELAIN LINED IRON SINK
WASTE CAN BE DRAINED OUTSIDE OR INTO A LARGE CROCK
BRAZE ON REDUCTION PIECE, THREADED FOR GARDEN HOSE
1/4" COPPER TUBE, TAPPED INTO HOUSE WATER SUPPLY

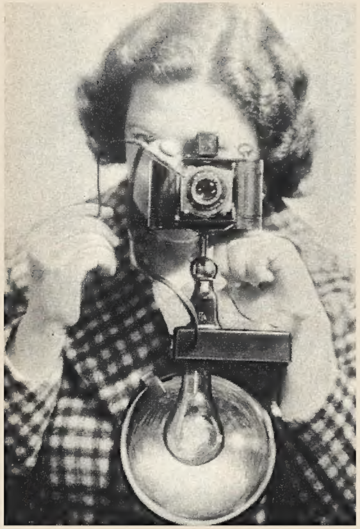
For a quiet, non-draft ventilation system designed to run continuously while the darkroom is occupied, a centrifugal type fan is mounted on a small motor, and installed above the door. The motor is inside the partition, the fan just outside, drawing air out through a 4-inch circular opening, Fig. 4. Over the fan is a wooden light-trap. Intake is through a number of holes distributed along the baseboard, and covered inside with a light-trap as illustrated in Fig. 5.

Details of the centrifugal fan and housing are shown in Fig. 6. The fan itself of relatively small diameter is made of duralumin or other stiff sheet metal. It has eight, inch-wide blades set off center, bolted or riveted to a disk of the same metal. Take care to have this in as accurate balance as possible to eliminate noise and vibration. The hub is simply a steel sleeve with screw holding fan to one end, and the armature shaft of motor inserted in the other end, secured with a set screw.

An ordinary porcelain-lined sink is set in

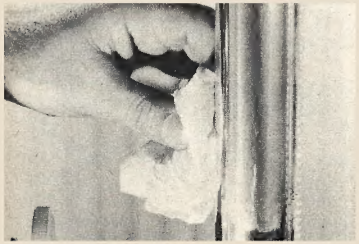
[*Continued on page* 138]

PHOTO KINKS



Swivel Head Holds Flash Synchronizer To Camera

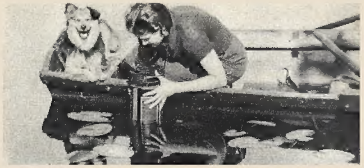
A TRIPOD swivel head makes a good coupling unit between a flash synchronizer and a small camera. It provides a good hand grip for the user, and at the same time it permits the unit to be swung to the right or left, for effective shadow control.



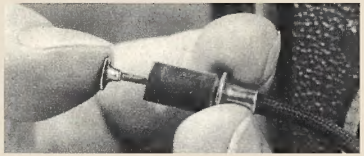
Subduing Reflections

IN PHOTOGRAPHING bright nickle, chromium or glass, reflections can be subdued by this new method making use of glycerine. Pat the latter on in a very thin film, and then rub it out smoothly to a matte appearance. It is easily removed later

Underwater Photographs



REMOVE one end of a 5-quart oil can, make a hole in the other end for the lens of your camera, and paint the interior dead black. Hold the open end under water, and interesting pictures, free of reflections, will result.



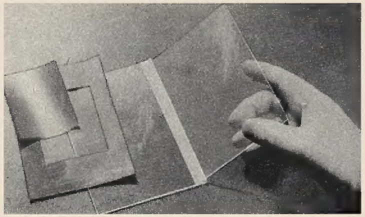
Easy Shutter Release

SLIP a short piece of soft rubber tubing over the cable release plunger so that it will offer some resistance. It will make a gentle "trigger squeeze" necessary, and thus eliminate jarring and fuzzy pictures.

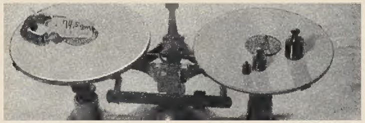
Screw Top Bottles

ASSORTED screw-top bottles found around the house make good containers for photo chemicals because they can be closed tightly. Beverage, medicine, shampoo, mouth wash, shaving lotion and other bottles, in 8, 16 and 32 oz. sizes, are very useful. Clean them out thoroughly before using.

Glass Print Frame

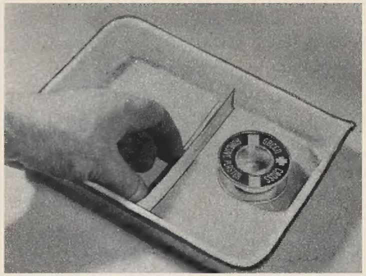


IN AN emergency, two sheets of glass, hinged together at one side by adhesive tape, make an excellent contact printing frame. Put an adhesive tape tab on one glass, as a handle.



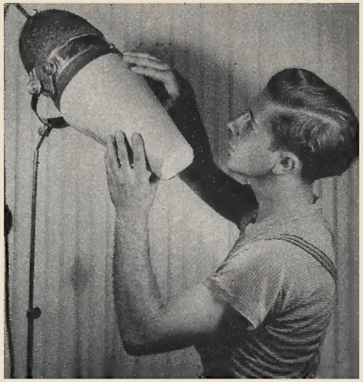
Iron Washer Weights

A SET of prepared weights, made of strings of iron washers or other odd pieces of metal, will save a lot of time when mixing up complicated developers. Tag each string with the weight figure and the name of the chemical.



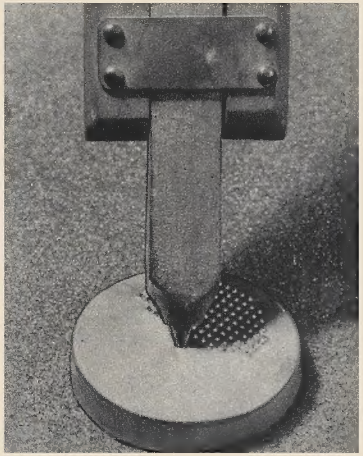
Divider In Tray

PILES of cut film being developed in a tray can be kept separated by a center divider. Make this of adhesive tape, pinched into a T; put it in place while the tray is dry.



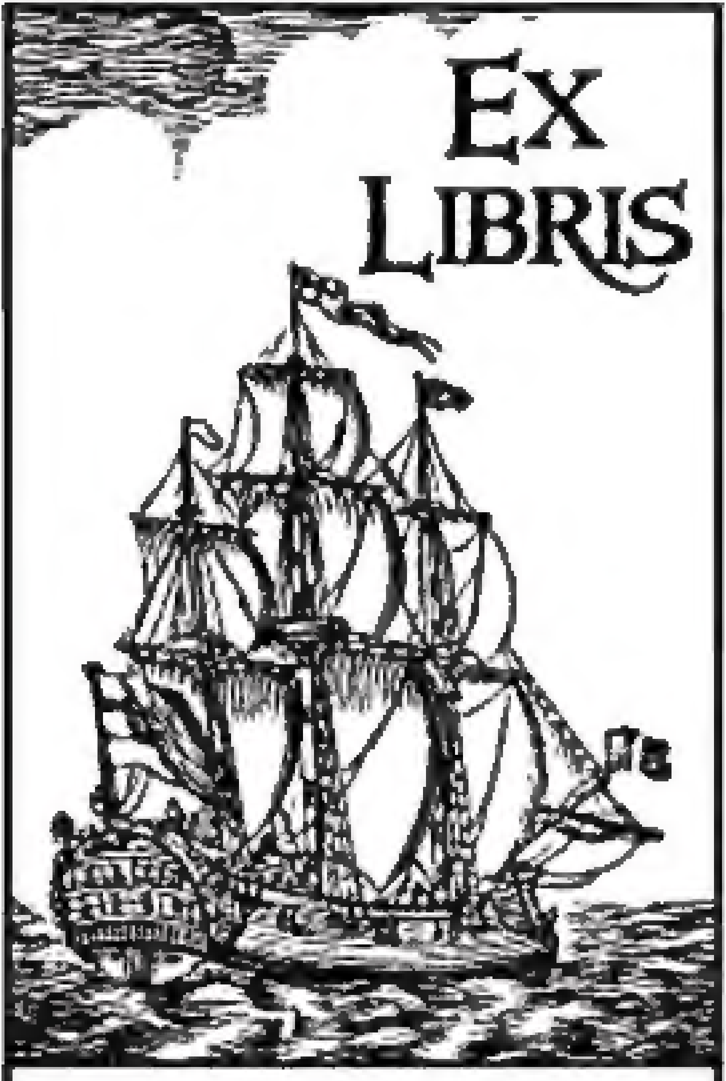
Concentrated Light Beam

WHEN a very narrow beam of light is desired from a spotlight, slip a cone formed of cardboard over the lens. The inside must be painted black to eliminate reflected light. The same idea can be applied to some types of floodlights. Hold the cone in place with a large rubber band.



Can-Lid Tripod Support

A NON-SLIP base for tripod legs is quickly made from a can lid, with a hole in the center. This will hold securely on sand, gravel, mud, etc.



Anon. Malefactor